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OF THE

MEDICAL SCIENCES.

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THE

AMERICAN JOURNAL

OF THE MEDICAL SCIENCES

FOR JANUARY 1867.

ART. I.—*Observations on Wounds of the Internal Jugular Vein and their Treatment, with Special Reference to the Safety of the Ligature; embracing a Statistical Account of Eighty-Six Cases, with some Remarks upon the General Applicability of Ligation as a Venous Hemostatic Agent.* By S. W. GROSS, M. D., late Surgeon and Brevet Lt.-Col. U. S. V.

DURING the past summer my attention was directed to the subject of wounds of veins and the arrest of venous hemorrhage by the application of the ligature, a procedure that I have been compelled to adopt in five thigh amputations with uniform success. Extending my investigations, it occurred to me to examine more minutely this much neglected branch of surgical pathology, with its attending and resulting accidents, and to publish, possibly, a series of papers on the injuries of special veins, confining my researches to the large trunks of the neck and extremities. Having collected a large mass of facts as a result of that undertaking, this paper, elucidating some points in the surgical pathology of the internal jugular vein, is now presented to the profession as the first attempt that has been made to classify the not very numerous isolated cases of wounds of that vessel. My aim has been to make an impartial examination of all the cases, and deduce from it the most convenient and successful plan of treatment.

The investigation of any statistical inquiry is always attended with more or less difficulty; the more so in the present case, as I was compelled to gain my information by referring to works not under the head of "wounds of the internal jugular vein;" but under the titles of tumours and wounds of the neck, suicide, ligation of the carotid artery, the introduction of air into veins, and hemorrhage. I have had access to the libraries of the

Pennsylvania Hospital, and of the College of Physicians of Philadelphia, the largest collections of medical works in this country; as well as to the carefully selected surgical library of my father, Dr. S. D. Gross, Professor of Surgery in the Jefferson Medical College, of this city. In most instances I have referred to the original papers, and not depended on second-hand quotations. In all cases the sources of information have been mentioned to enable the reader to refer to the author or journal from which they have been gathered; and as I have carefully consulted the medical periodicals of this and foreign countries, it is probable that few have escaped my notice. Several cases, heretofore unpublished, have also been incorporated in the paper.

It is very remarkable that wounds of the veins and venous hemorrhage, subjects replete with deep interest and of the utmost practical value, have been so little treated of, and have, indeed, been so much slighted. This neglect may have arisen from the fact that fatal instances of wounds of large venous trunks are comparatively seldom recorded, and that authors not having the time to devote to the investigation of these topics, remain content to repeat the very meagre and ill-digested accounts of the writers who have preceded them.

We thus find that Mr. Crisp, in his *Treatise on the Diseases of the Bloodvessels*, to which the Jacksonian Prize for the year 1844 was awarded by the Royal College of Surgeons of England, devotes three hundred and eleven pages to the arterial system, including arteritis, aneurism, and wounds; while his chapter on diseases of the veins occupies but twenty-six pages, of which about the same number of lines are given to the consideration of wounds of the veins. The entire chapter is unworthy a position in his admirable essay.[1]

Mr. Hodgson, to whom the Jacksonian Prize for the year 1811 was adjudged, for his *Treatise on the Diseases of Arteries and Veins*, treats of the veins somewhat more fully and satisfactorily than Mr. Crisp. The section on diseases of the veins occupies fifty-six pages, including only inflammation, obstruction, the collateral circulation, and varix. Wounds and hemorrhage are entirely ignored.[2]

Professor Wilson, in his *Lectures on the Blood and Vascular System*, allots eighteen pages to the anatomy and physiology of the veins, and devotes but fourteen to their diseases, namely: inflammation, suppuration, obliteration, varix, varicocele, and hæmorrhoids. He does not mention wounds, and merely alludes to venous hemorrhage, but fully discusses arterial hemorrhage.[3]

[1] A Treatise on the Structure, Diseases, and Injuries of the Bloodvessels. 8vo. pp. 354. London, 1847.

[2] A Treatise on the Diseases of Arteries and Veins, containing the Pathology and Treatment of Aneurisms and Wounded Arteries. 8vo. pp. 603. London, 1815.

[3] Lectures on the Blood and on the Anatomy, Physiology, and Surgical Pathology of the Vascular System of the Human Body. 8vo. pp. 429. London, 1819.

Mr. Wise, in his *Essay*, treats of wounds of the veins in one page, advising the application of a temporary ligature when it is required. The chapter on the diseases of the veins is rather more full than that on diseases of the arteries, and is a very great improvement on those of the preceding authors.[1]

The statement is very different in regard to wounded arteries and arterial hemorrhage, which have received the attention that their great importance demands. These topics may be found to be fully discussed in all systematic works on surgery, whereas in the very same volumes, injuries of the veins, if alluded to at all, are dismissed in a few paragraphs. In truth the literature of the subject is very meagre; and there are but few papers that can be consulted with any advantage. Of these, by far the most prominent and valuable, although by no means exhaustive, are the essay *On Wounds and Ligatures of the Veins*, by Mr. Benjamin Travers, of London;[2] the chapter *On the Veins*, by Professor Malgaigne, of Paris;[3] *Observations on the Surgical Pathology of the Veins*, by Professor Langenbeck, of Berlin;[4] and the chapters *On the Surgical Affections of the Veins*, by Professor Weber, of Heidelberg.[5]

The Ligature as a Measure for the Arrest of Venous Hemorrhage.— For the arrest of hemorrhage from wounded veins compression is generally advised as the least dangerous, if not the most convenient measure. In regard to the ligature there is a great diversity of opinion, due in later years, in my judgment, to a misunderstanding of the writings of Mr. Travers. The occurrence of a bad form of phlebitis after ligature, wound, or other mechanical injury is conceded by every one to be very uncommon, and in pointing out this fact as well as the origin of the constitutional disturbance attending it, Mr. Travers has narrated cases which have induced the reader to imagine that the accident is really more frequent than it is. As a result of inquiry and experiment, Mr. Travers has merely shown that the serious consequences sometimes following the puncture of a healthy vein, as in venesection, the operations of tying and dividing diseased veins, as varix of the internal saphenous, the complete or partial ligation of healthy veins, or spontaneous inflammation from an inflamed surface in which the vein lies, were due to extensive inflammation of the internal tunic of these vessels. In support of his views he has detailed four fatal cases from vene-

[1] Essay on the Pathology of the Blood and its Containing Vessels. Second ed. 8vo. pp. 388. Edinburgh, 1858.

[2] Cooper's and Travers' Surgical Essays. 8vo. Part I. London, 1818.

[3] Traité d'Anatomie Chirurgicale et de Chirurgie Expérimentale. Second ed. 8vo., vol. i. chap. x. pp. 306–349. Paris, 1859.

[4] "Beiträge zur Chirurgischen Pathologie der Venen." Archiv für Klinische Chirurgie. Band i. Berlin, 1860.

[5] Handbuch der Allgemeinen und Speciellen Chirurgie. Redigirt von Professors von Pitha und Billroth. 8vo. Bände I.–II. Erlangen, 1865.

section, five from ligation of varicose veins, and three from ligation of normal femoral veins. To these predisposing causes he might have added another, namely, the mere exposure of a deep vein during dissection, as in the removal of tumours or the operation for aneurism. From his experiments upon animals he infers that the lining membrane of a vein is susceptible of adhesive inflammation to a very slight extent compared with that of an artery. "Indeed," he remarks of the ligature, "the process of healing and division by ulceration, seem to be conducted without any manifest sign of inflammatory action of the internal tunic;" the obliteration of the vessel being due to interstitial deposits in its coats. Mr. Travers insists on this indisposition of the inner coat to inflame; and that when that process is set up, the inflammation is diffused or continuous. The whole object of his *Essay* is contained in his concluding paragraph, where he says:—

"It is an error to suppose that any quicker sympathy exists between the constitution and venous, than the arterial or absorbent system. I say this because I have observed something like that superstitious alarm, which is excited by events that we do not expect and cannot explain, has been produced by the fatal catalogue of tied veins, and a comparison of this with the generally successful cases of tied arteries. All the mystery of veins is, as I have attempted to show, that they are indisposed to inflame; but when excited, inflame by continuity, and therefore it is that the constitution sympathizes so deeply."

Mr. Travers ascribes the origin of the diffused inflammation to venesection, the ligature or any other local mechanical injury acting upon a *peculiar state of the constitution.* He would, therefore, avoid ligation, as it is not always possible to determine the condition of the blood of a patient upon whom an operation is to be performed. It is thus seen that Mr. Travers has been placed in a false position in regard to the secondary effects produced upon the system by the application of the ligature to a wounded vein. On the second page of his *Essay* he remarks:—

"I have frequently seen the femoral vein tied without any obvious ill effect; and one of the most experienced and successful operators in the west of England lately assured me that he had been in the constant practice of tying the main vein distinctly from the artery in amputations."

The Ligature an Ancient Procedure.—The ancient surgeons, it must be agreed with Mr. Travers, "treated the veins with singular rudeness—pricking, cutting, tying, and burning them, without ever adverting to any other than the mechanical effects of such operations upon the diseases for which they were instituted." The use of the ligature in early days was empirical, the circulation of the blood in the vessels to which it was applied not being understood. It was supposed that the veins alone carried blood, and that when this fluid was found in the arteries the occurrence was altogether accidental; an error which was, however, pointed out by Galen in the second century. The treatment of hemorrhage from stumps of amputation was, therefore, of the most barbarous description, the red-hot iron being the favourite remedy, together with boiling tar, turpentine, oil, vitriol, and other astringents, until the middle of the sixteenth century, when Ambrose Paré substi-

tuted the ligature, which had only been used before his time as an exceptional measure, and one in which little confidence was reposed. To Paré is due the credit of having used a thread to restrain the bleeding from the vessels of an amputated limb, the ligature having been employed exclusively, before his great invention, for the treatment of aneurisms and wounded vessels. It is a great mistake to suppose that the old physicians were not well acquainted with the subject of hemorrhage, and equally as great a misconception to apply the term artery to "*vas*," which simply means a vessel, whether an artery or a vein.

Celsus, who flourished just before the Christian era, distinctly states that for the arrest of bleeding, the vessel is to be tied in two places, and the intermediate portion divided: "Venæ quæ sanguinem fundunt apprehendendæ, circaque id quod ictum est duobus locis delegandae intercidendæque sunt," a precept which was followed for many centuries whenever the ligature was employed. Archigenes, who practised at Rome about the 108th year after the birth of Christ, speaks of sewing the bloodvessels after amputation. Somewhat later, Galen, who was well acquainted with the anastomoses of veins and arteries, advised torsion of the veins, or, if this failed, styptics or obstruents, avoiding the ligature, which would, however, sometimes be necessary. In this practice he was followed by Paulus Ægineta and Aetius. Of the early modern writers, we find that Avicenna, Averrhoes, Rhazes, Haly Abbas, Brunus, Theodoric, Roland, Lanfranc, Albucasis, Avenzoar, Guy of Chauliac, Hollier, Calmetheus, Vesalius, Vigo, Tagaultius, Peter of Argelata, Andreas, Dalechamps, Bertapaglia, Benivieni, Marianus, Bolognini, Ambrose Paré, and many others, strongly advised the ligation of all bleeding arteries and veins, a course of practice which must be considered as a great advance on our own times.

In the eighteenth century, it was the common custom to include the vein with its corresponding artery in the ligature after amputations, or in the operation for aneurism. So general was this procedure that Guattani, in 1772, had to advise separation of the vein and nerve, to guard against the inconveniences ascribed to injury of the nerve alone:—

"In recommending ligation of the artery alone, without the vein and nerve, I do not think I depart in any way from what is reasonable and right, although I know full well that many high authorities, among whom I may mention the celebrated Mollinelli, are of the opinion that the separation of the vein and nerve from the artery, in the operation of aneurism is of but little, if of any moment." (*Observations on Aneurism.* Translated and edited by J. E. Erichsen. 8vo. p. 271. London: Sydenham Society, 1844.)

It is not generally known that the celebrated John Hunter included the femoral vein in the ligature with the artery in his first three operations for popliteal aneurism. On this subject, M. Deschamps, 1797, also writes:—

"In the ninth case, I included within the ligature the whole bundle of vessels, that is to say, both the artery and vein. Some doubts have been thrown

upon the advisability of ligaturing veins, but the experience of all ages, as well as anatomical considerations, will serve to remove this imaginary dread. There are no principal veins as there are main arteries; they are so numerous, and their diameter is so great in comparison to arteries, that the return of blood is no way retarded, and I do not think that the surgeon need ever trouble himself about separating the vein from the artery." (Ibid., p. 455.)

During the latter part of the same century, Desault urged ligation of the femoral vein and artery in thigh amputations: "When the two vessels are near to each other, as is generally the case, introduce one leg of the forceps into the artery and the other into the vein; draw them outward at the same time, and secure them by a common ligature. When they are at a distance tie them successively."[1]

Authors of the Nineteenth Century in favor of Ligation of Veins.—Up to 1818, when Mr. Travers published his essay on the veins, but little reference had been made to the supposed dangers of venous deligation. In Great Britain and Ireland, at that time, the procedure was practised to a very limited extent, and the same statement is true at the present date. Professor Velpeau, by his example, did much to dispel the prejudices against the ligature in France, so that it is now regarded as a safe hemostatic agent in that empire. In Germany, Dr. Minkiewicz, Dr. Weber, and Dr. Neudörfer, have shown that the ligature is harmless, and I have been informed by the latter gentleman that its adoption has become almost universal. In this country, the teachings of Professors Mott, Pancoast, Gross, and Stone, have done much to correct the errors existing against its employment, so that it is very generally applied. Since there is a great difference of opinion as regards venous deligation, it may not be uninteresting or uninstructive to record the views of the most prominent authors of all countries, of the present century, in favor of or against the procedure, premising, however, that the ligature is recommended in those cases only in which it is absolutely necessary.

Benjamin Bell, 1804, treating of large wounds of the veins, says: "The same remedy, therefore, should be employed here that we daily use in hemorrhage from wounds in arteries, namely, ligatures; which, when properly applied, never fail to answer the purpose." (*A System of Surgery*, 2d Amer. edit., p. 224. Troy, N. Y., 1804.)

Mr. Hey, 1805, writes: "Having seen a few instances of bleeding from the femoral vein, I generally inclose the vein in the ligature along with the artery." (*Practical Observations in Surgery*, p. 319. Phila., 1805.)

Mr. Chevalier, 1806, says: "I know from experience that the principal vein of a limb may be included in the same ligature as the artery without any disadvantage ensuing." (*A Treatise on Gunshot Wounds*, 3d edition, p. 76. 1806.)

Professor Jameson, 1827, writing of the arrest of bleeding, remarks: "We have had occasionally, in depraved habits, to tie some of the larger veins; we have seen a number of veins pour out blood freely in such habits,

[1] The Surgical Works of Desault. By X. Bichat. Translated by E. D. Smith, M. D. pp. 476. Philadelphia, 1814.

and have arrested it by using the crooked needle, by means of which we included in an animal ligature a considerable portion of the surrounding structure, and our experience warrants us in saying that no injury will arise from using an animal ligature in that way, when it may be found necessary." (*Philadelphia Medical Recorder*, p. 37, vol. ii 1827.)

Baron Larrey, 1829, designedly tied the femoral, the larger branches of the internal saphenous, the brachial, and other veins, for hemorrhage, and never witnessed any accident which could be attributed to their inflammation. In his thigh amputations, he always tied the femoral vein with the corresponding artery, without once seeing any marks of the pretended phlebitis. "We can thus confidently include with the artery their accompanying veins, no matter how large, in spite of the opinions expressed by some physicians." (*Clinique Chirurgicale*, tome iii. pp. 485–489. Paris, 1829.)

Dr. Hennen, 1830, says: "Yet cases will occur, especially in amputation, where the large veins may, under certain circumstances, be secured with a fine ligature, not only without danger, but with advantage; in truth, if there were such imminent danger as has been apprehended, the needle, by which the vein was included in the same ligature as the artery, before the tenaculum came into general use, must have been a most destructive instrument: thousands of successful operations, however, attest the contrary."[1]

M. Sabatier, 1832, remarks: "We should not hesitate to apply a ligature to a wounded vein."[2]

M. Sanson, 1835, would not hesitate to ligate when other means failed.[3]

M. Bégin, 1838, teaches that when large veins are divided in operations, it is almost invariably necessary to tie both ends.[4]

M. Dupuytren, 1839, says: "When the vein is nearly or completely severed, the ligature or compression must be applied between the wound and the capillaries."[5]

Mr. S. Cooper, 1842, writes: "A good deal of blood is sometimes lost from the mouths of the larger veins, and when they bleed much in debilitated subjects, I think Dr. Hennen is right in recommending them to be tied."[6]

M. Nélaton, 1844, says that "the ligature is employed with the same success on arteries and veins."[7]

Mr. Liston, 1846, writes: "Great danger is supposed to accrue from the application of ligatures to veins, and the practice is generally avoided; an open state of their divided extremities, after suppuration is established, is equally, if not more to be avoided."[8]

M. Malgaigne, 1846, says: "All the proceedings applicable to arteries are so also to veins."[9]

Mr. South, 1847, favors the ligature, and writes: "I have tied the femoral vein many times, and in but a single case with ill consequences; the

[1] Principles of Military Surgery, p. 151. Philadelphia, 1830.
[2] Médecine Opératoire, tome ii. p. 182. Paris, 1832.
[3] Dictionnaire de Méd. et de Chirurgie Prat., tome iii. p. 231. Paris, 1835.
[4] Nouveaux Élémens de Chirurgie et de Médecine Opératoire, 2d edit., vol. i. p. 376. Paris, 1838.
[5] Leçons Orales de Clinique Chirurgicale, 2d edit., vol. vi. p. 555. Paris, 1839.
[6] Surgical Dictionary, Amer. edit., p. 64. New York, 1842.
[7] Élémens de Pathologie Chirurgicale, vol. i. p. 134. Paris, 1844.
[8] Practical Surgery, 4th edit., p. 21. London, 1846.
[9] Manual of Operative Surgery, translated by Brittan, p. 50 Phila. 1851.

patient had inflammation and pus in the iliac veins, but as this occasionally happens without a ligature having been applied, it may be questioned whether the ligature was the cause of the mischief or not."[1]

Dr. Chelius, 1847, remarks: "If, however, bleeding from a large vein should continue, it is necessary to tie it; in such cases, for instance in amputations, in which I have frequently tied large veins, I have never observed any symptoms of phlebitis."[2]

Professor Gibson, 1850, is persuaded that the risks of the ligature are greatly exaggerated: "I only mean to imply that there is less danger in tying a vein than is commonly imagined. Influenced by this opinion, I ventured in the case I have related above, to tie the internal jugular in two places."[3]

Mr. Skey, 1851, writes: "I believe the reports of the danger consequent on the application of a ligature around a vein to be greatly exaggerated. In the case of a puncture, however, we have no reasonable alternative but the ligature, and I know of no evidence of any injurious consequences to the vein which would justify us in rejecting it."[4]

M. Sédillot, 1855, says that if large veins continue to bleed, we must have recourse to direct and immediate compression, or include them in a ligature.[5]

M. Richet, 1855, writes: "In very large wounds of the great venous trunks we must ligate."[6]

M. Velpeau, 1856, speaking of hemorrhage from veins of amputated limbs, thinks it would be wrong not to tie them: "The dangers of ligature, upon which so many surgeons have insisted for half a century, are shown to be farthest from the truth, and I should not be surprised to find that it would prove more advantageous to surround them immediately with a ligature, than to leave them free at the bottom of a wound."[7]

Mr. Macleod, 1858, entertains the same opinion as M. Velpeau and Mr. Liston: "It is a question on which it is difficult to decide whether or not, when pus absorption is so common as it was with us, it would not be justifiable practice to ligate the chief vein at the time of the operation. The views of Mr. Travers and others would certainly seem to oppose the adoption of such a step, but we have, on the other hand, the evident absorption of pus into the system by this channel; and, besides, numerous cases are on record in which the ligature of a vein has not only not been followed by evil results, but has absolutely been the apparent cause of preventing inflammation and pus absorption. This is particularly well illustrated in a case related by Mr. Johnston, of St. George's Hospital, in the journals of 1857. In that case those vessels which had been tied were free both of inflammation and pus, while those not included in ligatures were full of pus and 'much inflamed.'"[8]

Mr. Moore, 1860, says: "Pressure is also sufficient to arrest the bleeding from the largest veins divided in amputations; though occasionally,

[1] A System of Surgery, by J. M. Chelius, M. D., translated by J. F. South, vol. iii. p. 644. Phila. 1847.
[2] Ibid., vol. i. p. 353.
[3] Institutes and Practice of Surgery, 8th edit., vol. i. p. 200. Phila. 1850.
[4] Operative Surgery, p. 198. Phila. 1851.
[5] Traité de Médecine Opératoire, 2d edit., vol. ii. p. 193. Paris, 1855.
[6] Traité Pratique d'Anatomie Médico-Chirurgicale, p. 152. Paris, 1855.
[7] Operative Surgery, 4th Amer. edit., vol. ii. p. 2. New York, 1856.
[8] Notes on the Surgery of the War in the Crimea, p. 395. London, 1858.

when the loss of blood may seriously affect the issue of the case, it is wisest to tie them."[1]

Dr. Williams, 1862, writes: "In any case when pressure has failed to restrain hemorrhage from a completely divided vein, a ligature should be applied, first to the lower orifice, and secondly to the upper one, in the event of its bleeding from a retrograde circulation."[2]

Mr. Callender, 1862, in discussing the causes of suppurative phlebitis, makes use of the following emphatic language: "And it often occurs after amputation, as after other wounds; not, however, in consequence of ligatures applied to veins after any such operation. Whether these vessels be tied or not, this inflammation may supervene; indeed in every amputation, as remarked by Blandin, the veins which accompany small arteries are always tied; and we have no right to argue that the ligature of a large vein is more likely to be followed by diffused inflammation of its wall, than is that of the smaller vessels. Such an assumption cannot be justified. Moreover, ligatures separate from veins, as already shown, without exciting inflammatory changes."[3]

Dr. Neudörfer, 1864, says: "It is self-evident that in those accidents, where ligation of a vein is practicable, to do it without hesitation, and without fear, since the danger of exciting phlebitis and pyæmia by ligating a vein is an exploded doctrine with surgeons."[4]

Mr. Solly, 1865, writes: "I can state, from the experience of more than thirty years in this large Hospital (St. Thomas's), that veins may be tied with impunity; but I am also bound to add, that I have seen phlebitis follow the use of the ligature, and a fatal result the sequence, if not the consequence, of the practice."[5]

Dr. Weber, 1865, states that all the measures for restraining hemorrhage from arteries are applicable to the veins, and that the application of the ligature to the veins is free from danger.[6]

Professor Gross, 1866, says: "Great prejudice exists against ligating veins, but experience has shown that the fears that are entertained upon this subject are, if not entirely ill-founded, greatly exaggerated. The largest veins, as the internal jugular and femoral, have repeatedly been tied with impunity. I have myself never hesitated to adopt this treatment when occasion seemed to demand it."[7]

Authors of the Nineteenth Century Opposed to the Ligation of Veins.—*M. Roux*, 1813, states that "if compression is insufficient to arrest the hemorrhage, it will be necessary to ligate the vein, an event, when practised, even more to be feared."[8]

Mr. Travers, 1818, is opposed to tying veins, as it sometimes gives rise to a diffused and fatal inflammation of the inner coat of the vessels.[9]

Mr. Allan, 1821, has seen the axillary vein cut and ligated in two instances of removal of tumours from the axilla. In one of these death ensued, on which account, he says: "I apprehend that the ligature should

[1] A System of Surgery, edited by T. Holmes, vol. i. p. 695. London, 1860.
[2] Costello's Cyclopedia of Practical Surgery, vol. ii. p. 528. London, 1862.
[3] A System of Surgery, by T. Holmes, vol. iii. p. 303. London, 1862.
[4] Handbuch der Kriegschirurgie, p. 69. Leipzig, 1864.
[5] Surgical Experiences, p. 279. London, 1865.
[6] Handbuch der Allgemeinen und Speciellen Chirurgie. Redigirt von Profs. Von Pitha und Billroth, vol. i. p. 166. Erlangen, 1865.
[7] A System of Surgery, 4th edit., vol. i. p. 511. Phila. 1866.
[8] Nouveaux Élémens de Médecine Opératoire, vol. i. p. 249. Paris, 1813.
[9] Loc. cit., ut ante.

never be employed in wounds of the veins; more especially as the hemorrhage may always be easily suppressed by compression, either without or within the wound."[1]

M. Lisfranc, 1845, has seen ligation of veins so often followed by phlebitis that he is very doubtful of the safety of the operation.[2]

Mr. Crisp, 1847, speaking of division of the veins, says: "Dangerous and fatal hemorrhage will sometimes take place from this cause, and it is occasionally necessary to have recourse to the ligature. It must be recollected, however, that the veins are more prone to diffused inflammation than the arteries, and on this account the use of the ligature should be avoided if possible."[3]

Mr. Wise, 1859, is opposed to the usual manner of ligating a vein by division of its outer coat, lest the dangerous irritation of its lining membrane be increased, and he proposes flat ligatures to approximate the sides of the vessels, which are to be removed in a few hours, or at the first dressing. (*Op. cit.*, p. 369.)

Dr. Günther, 1859, believes the ligation of large veins to be injurious, as it may excite phlebitis, and, through it, pyæmia.[4]

Dr. Langenbeck, 1860, evidently thinks the ligature is to be avoided whenever it is possible, particularly in crowded hospitals, where the danger from thrombosis and pyæmia is increased; although he has narrated three examples of the procedure as applied to the internal jugular vein, he would, as a rule, avoid it. (*Op. cit.*)

Mr. Porter, 1863, says: "Surgeons in this country are not favourable to the practice of ligaturing a vein, although having the sanction of such authorities as Hey, Desault, and Hennen. The dangerous, and sometimes fatal phlebitis, following such procedure, has given us a wholesome dread of tying or in any way inflicting injury on these vessels."[5]

Mr. Miller, 1864, writes: "By every means in our power, we ought to avoid deligation of a vein. For, as will afterwards be seen, a form of phlebitis ensues, which, especially in its higher grade, is apt to spread; and, therefore, it need be no matter of surprise to find the very worst results of that disease supervening on the application of a ligature to a vein."[6]

Mr. Erichsen, 1864, says: "If the vein be one of considerable size, as the internal jugular; or if it be so situated that pressure cannot be brought to bear on it, it may require the application of a ligature; but this should, if possible, always be avoided, inasmuch as it is apt to occasion dangerous inflammation of the vessel."[7]

Mr. Pirogoff, 1864, is much opposed to the ligature, and remarks: "Suffice it to say that I have lost all my patients from pyæmia in whom I, and other surgeons in my presence, have been compelled to tie the femoral or axillary veins."[8]

It thus appears that there is a great difference of opinion among

[1] A System of Pathological and Operative Surgery, vol. ii. p. 432. Edinburgh, 1821.
[2] Précis de Médecine Opératoire, vol. i. p. 94. Paris, 1845.
[3] Op. cit., p. 334.
[4] Lehre von den Blutigen Operationen am Menschlichen Körper. Erste Abtheilung, p. 55. Leipzig und Heidelberg, 1859.
[5] Dublin Quarterly Journal, Nov. 1863, p. 269.
[6] A System of Surgery, p. 229. Edinburgh, 1864.
[7] Science and Art of Surgery, p. 154. London, 1864.
[8] Grundzüge der Allgemeinen Kriegschirurgie, p. 440. Leipzig, 1864.

the authors whom we have mentioned as to the applicability of the ligature for the suppression of venous hemorrhage. The majority are in favour of the procedure, and the list might be largely increased, if we were to include those who advocate the operation in cases where compression is inapplicable, or death seems to be impending from alarming loss of blood. This difference of opinion may be due, in some measure, to an imperfect examination of the subject, very slight experience, or to prejudices in favour of or opposed to the procedure. The true reason, however, seems to depend upon a difference of sentiment in regard to the cause of pyæmia, which accident those authors, who are opposed to the measure, appear to fear most. The dangers of a fatal issue from this cause are, I am fully convinced, from a very extended investigation of the cases of ligation of veins, very greatly exaggerated, and I am sure that the surgeons who consider this accident as the most frequent cause of death, have either not examined the subject, or, at best, only very superficially, exhibiting that tendency, unfortunately too often seen to the detriment of the progress of science, in our profession, to adopt the opinions of men who justly hold a prominent position.

Phlebitis and Pyæmia as assumed Dangers.—It is not my purpose to enter into any extended inquiry into the various theories of the pathology of pyæmia, as the investigation of the subject would require too much space, and would be out of place. Suffice it to say that I regard the affection known as pyæmia as a zymotic disease, having for its exciting cause a vitiated condition of the blood, due to the introduction of a septic poison into the system, which may be called into action, and evince its peculiar phenomena from a great variety of secondary causes. It is just on this point that authors are not agreed, and it must, therefore, be expected that as long as primary phlebitis is held by many surgeons to be the cause of pyæmia, instead of the effect, just so long will they withhold the ligature for fear of exciting diffused or purulent phlebitis. The healthy, or adhesive inflammation of Mr. Hunter, such as is produced by the ligature, is an unimportant and perfectly innocent affection, just as necessary to the closure of a wounded or tied vein, as to the same conditions of an artery. The inflammatory action has for its object the formation of a clot and its adhesion to the inner wall of the vessel; and even when it oversteps this limit, it is often seen to be circumscribed by deposits of lymph, giving rise to an abscess within the walls of the vessel, which is thus cut off from the general circulation. I cannot agree with Mr. Travers, Mr. Callender, and other observers, that the thread acts "without exciting inflammatory changes." How else are we to account for the injection and redness of the outer coats, the deposition of serum and lymph, the death of the portion of the vessel included in the ligature, and its subsequent separation by ulcerative action? If these authors mean to confine their statements to the lining membrane of the vein, I think they are correct, as numerous observations

and experiments have proved that it is difficult to produce marks of inflammatory action in that tunic. It may then be concluded that the changes take place in the external cellular tunic, and to a lesser degree in the middle coat, with, as Dr. Mackenzie thinks, an irritated state of the lining membrane.

Assuming, then, that unhealthy or suppurative phlebitis and its secondary effects depend upon a vitiated state of the blood, we are able to appreciate how it is that those affections may follow various dissimilar injuries, and reconcile the infrequency of their occurrence after operations involving the venous system. The dangers are not to be looked for when the general condition of the system of the individual is good, and when the walls of the vessels are in a healthy state; but they may be anticipated in enfeebled and broken-down constitutions, more particularly when the coats of the vessels are abnormally changed. Upon such a class of persons operative procedures should, therefore, if possible, be avoided.

The causes which predispose to the occurrence of phlebitis and pyæmia are those which favour the development of an enfeebled condition of the system, and a vitiated state of the blood, which shows a tendency to coagulate in the vessels. Thus bad food, exposure and scurvy, peculiar states of the atmosphere, the impure air of crowded hospitals, the puerperal state in feeble and nervous women, and certain protracted diseases, as gangrene, phthisis, Bright's disease of the kidney, and typhoid fever, strongly favour their occurrence. Of the traumatic causes, the most common are operations upon the bones and joints, injuries of the head, the shock and exhaustion following profuse loss of blood in surgical operations, and serious and extensive injuries. The extension of unhealthy inflammation from lacerated wounds, comminuted fractures, and wounds made in operative procedures, from the slightest puncture, as that made in phlebotomy, to the largest incisions, also favour their development. Mr. Guthrie considered that pyæmia was the most frequent cause of death after amputation. It may also arise from an abscess discharging its contents into an ulcerated vein, several examples of which accident connected with the internal jugular vein, are on record. In a very interesting paper entitled *A Pathological Inquiry into the Secondary Effects of Inflammation of the Veins*, Mr. Arnott has narrated ten fatal cases of pyæmia following venesection; two from wound of the femoral vein in the operation for popliteal aneurism; one after division, and one after excision of a portion of a varicose vein; and three after thigh amputations, in only one of which was a ligature applied to the femoral vein. The post-mortem examinations showed pus, or pus with lymph, in the vessel in fourteen instances; in two lymph was present, but no mention is made of pus; and in one neither fluid was apparent. Pyæmia and metastatic abscesses were also the causes of death in thirty-seven cases of injury of the head, the majority of which were attended with fracture or loss of portions of

the bone. Mr. Arnott, therefore, concludes that "these considerations show that the secondary effects of phlebitis are connected with a vitiated state of the circulating fluid; a further proof of which may be found in the yellow colour of the skin, so constantly observed in cases of this disease."[1]

An altered state of the blood, and not the existence of primary phlebitis, must then be regarded as the starting point of these morbid changes; and in idiopathic cases the spontaneous coagulation of the blood gives rise to secondary phlebitis and to mestastatic abscesses in the different tissues and organs of the body. By the application of a ligature to a vein, or in any of the operations for varicose veins, either by caustics, compression, or by subcutaneous ligation or division, we cause a coagulum to form as a result of mechanical irritation of the vessel itself; and coagula also form whenever a vein is partially or completely divided, without the application of a thread. Upon the quality of these concretions will depend the issue of each case. Thus if the fibrin be deposited from an impoverished or morbidly altered blood, these clots will soften and become broken down into a puriform fluid, which will give rise to a train of symptoms denotive of the occurrence of pyæmia, or of acute phlebitis. From the fact of the disintegration commencing at the centre of the clots, additional evidence is afforded of the blood, and not of the walls of the vein, being the origin of the disease. If, on the other hand, the clot be the result of irritation of a vein occurring in a person in whom the circulating fluid is healthy, the worst event that can follow will be simple obstruction or obliteration of the cavity of the vessel.

The Ligature, if properly applied, not the Cause of Pyæmia.—The most common predisposing causes of pyæmia are the slight puncture made by the lancet in venesection, the extension of inflammation from unhealthy stumps and wounds into open veins, and operations on the veins and on the bones in which the venous orifices are patulous. The ligature has also been accused of being productive of the same occurrence, and it, therefore, becomes a very important inquiry whether it has any agency in the mortality of operations. From the preceding considerations of the pathology of phlebitis—and for further information on this subject, the very interesting work of Mr. Henry Lee,[2] and the contributions of Mr. G. W. Callender,[3] may be consulted—it is seen that the formation of a clot is sometimes the consequence and sometimes the cause of phlebitis, the former depending on a vitiated blood, the latter on irritation of the vessels; and that the subsequent changes in the clot determine the morbid phenomena. It is not, however, to be inferred that the coagula are always necessary

[1] Medico-Chirurgical Transactions, vol. xv. p. 61. London, 1829.

[2] On Diseases of the Veins, Hæmorrhoidal Tumours, and other Affections of the Rectum. Second edition. London, Churchill, 1866.

[3] A System of Surgery. Edited by T. Holmes, vols. i. iii. London, 1860-1862.

to the production of pyæmia, or the healing process of wounded veins, since they are sometimes altogether absent. The clot of a ligated vein is more delicate and smaller than that of a divided vein, and it is the extension of the clot into the latter that so often proves the source of pyæmia after amputations. After a very careful examination of the whole subject, *I do not hesitate to state that the occurrence of pyæmia, when of traumatic origin, is due to the wound of the vessel itself, and not to the ligature; that a predisposition to the disease, or, rather, a peculiar morbid condition of the blood, is necessary for its development; and that when that predisposition exists, the affection may show itself whether the vein has been tied or not: in other words, when the coats of the vessel are healthy, and the condition of the blood is normal, the ligature is never the starting-point of pyæmia.*

In making this assertion—the "exploded doctrine" of Dr. Neudörfer—I am aware that I shall meet with much opposition, and be expected to support my views by facts. By referring to "Table No. I." "Fatal Cases of Wounds of the Internal Jugular Vein," it will be seen that twelve cases were fatal secondarily, five from hemorrhage, *five from pyæmia*, and two from other causes, and that in none of the cases was any mode of treatment adopted, much less the ligature. On referring to "Tables II. and III." it will be seen that the same vein was ligated in forty-one instances, and that the deductions are based on forty cases, in which the results are known. Death is referable to the employment of the ligature in five cases only, and of these four were carried off by secondary hemorrhage, and *but one by pyæmia*, and in that case no post-mortem examination was held, so that it really proves nothing. Let it be added that the ligature was required in all the cases to prevent death either from the loss of blood or from the introduction of air, and that the vein was wounded in twenty-eight of the cases in the removal of tumours of the neck. May it not, then, fairly be concluded that the ligature had nothing to do with the fatal case of pyæmia, but that the operation itself was the cause of death; showing the very remarkable result of mortality from pyæmia in the extirpation of tumours of the neck of only 3.57 per cent.

I have also collected fifteen cases of ligation of the axillary vein, and twenty of the external jugular—and the list could have been much extended—without one death from pyæmia. The conclusion has, therefore, been forced upon me that *the ligature must be excluded from the category of the predisposing causes of pyæmia.*

The Ligature as a Means of Preventing the Extension of Unhealthy Inflammation.—On reviewing the opinions of the authors not opposed to tying veins, one cannot fail to be struck with certain expressions showing that the ligature is not only not to be avoided, but that its use is indicated, when pyæmia prevails epidemically, or when the elements of that affection are supposed to pre-exist in the system of the individual. Dr. Hennen

states that large veins may be tied, not only without danger, but with advantage. After suppuration of a wound had taken place, Mr. Liston feared an open state of the divided extremities of veins much more than when a thread had been applied. M. Velpeau says that he would not be surprised to find that it would prove more advantageous to surround the divided veins immediately with a ligature than to leave them open at the bottom of a wound. Mr. Macleod, writing of the mortality of amputated cases from pyæmia in the Crimea, questions whether it would not be better to tie the chief vein of amputated limbs, to prevent the evident absorption of pus by that channel. Numerous recorded cases, he remarks, show not only no ill effects from the procedure, but that it has absolutely been the apparent cause of preventing inflammation and the absorption of pus. The frequency of pyæmia after amputation is attested by the experience of all surgeons. Mr. Bryant gives it as the cause of death in 42 per cent. of all fatal cases of amputations, and in 10 per cent. of all amputations, the observations having been based upon 300 cases.[1] If the changes preceding the appearance of the signs of systemic infection are to be looked for in the clot in the interior of the vessel, it is of primary importance to induce a coagulum of small size. The clot which extends into the open extremity of a divided vein of a stump is larger than that produced by the application of a ligature, so that the latter expedient would seem to be indicated. This is particularly well seen in the case of Mr. Johnston, quoted by Mr. Macleod, in which "*those vessels which had been tied were free both of inflammation and pus, while those not included in ligatures were full of pus and much inflamed.*"

The extension of local inflammation to neighbouring veins when a ligature has not been used is well shown in the table of fatal wounds of the internal jugular vein, before referred to. Pyæmia was the cause of death in 25 per cent. of all the cases, and in 41.66 per cent. of all the cases secondarily fatal. In all, abscesses had formed about the sheath of the vessels. In Case XIV. the small veins in the neighbourhood of the abscess were filled with broken-down coagula. In Case XVI. there was an abscess of six ounces' capacity between the vertebral column and the sheath of the vessels, and the vein showed marks of high inflammatory action. An abscess had also formed in Case XVII. behind the vessels, and the post-mortem inspection on the fifteenth day after the injury indicated a round opening in the internal jugular vein, two lines in diameter, and the cavity of the vessel occupied by a broken-down clot. It is proper to add that in this case M. Tacheron would have applied a ligature, had it been possible to do so. In Case XVIII. the wound was open, the coats of the vein were infiltrated with lymph, and the interior filled with fibrin, while the neighbouring veins showed the effects of phlebitis. By contrasting these cases

[1] "On the Causes of Death after Amputation." Medico-Chirurgical Transactions, vol. xxiv. 2d Series. London, 1859.

in which the ligature was withheld with those in which the jugular vein was tied, it may fairly be assumed that *the ligature may prevent diffused inflammation of the walls of a vein and the phenomena included under the general term of pyæmia.*

In the preceding considerations, which refer to the safety of the ligature when properly applied, I have endeavoured to show that venous deligation is not to be avoided from the fear of exciting pyæmia. I have now to consider some of the causes which may produce that affection, under unfavourable circumstances, in the case of the internal jugular vein.

The Ligature Improperly Applied as a Cause of Diffused Phlebitis.—In the operation for aneurism it occasionally happens that the accompanying vein is transfixed by the aneurism needle, and if the mistake be not discovered, and the ligature withdrawn and applied at another point, it will act as a seton within the cavity of the vessel, and induce the train of symptoms referable to diffused phlebitis and the production of systemic infection. A number of such fatal cases are on record, in which the femoral vein has been pierced in the Hunterian operation for popliteal aneurism. The following cases of death from wounds of the internal jugular vein were evidently due to this accident producing pyæmia, although it is not so stated by Mr. Arnott in his paper "On the Secondary Effects of Inflammation of the Veins," before mentioned, nor by Professor Van Buren, of New York, in the second case.

CASE I.—"A young man had a ligature placed on the left carotid artery for an aneurismal disease of one of its temporal branches. Considerable difficulty was experienced in passing the needle round the vessel. Venous hemorrhage took place during the operation, recurred at night, and occasionally afterwards, for nine or ten days. On the fifth day after the operation, the patient had a severe rigor, succeeded by heat of skin and general febrile symptoms. These increased, the pulse rose to 120, and the constitutional disturbance assumed a very violent character. About the tenth day, the vision of the left eye became impaired, and was quickly lost, the pupil was contracted, the iris immovable, and the cornea had a somewhat hazy appearance; effusion took place under the conjunctiva, and the eyelids were greatly swollen, giving the appearance of the globe being much protruded; at the same time, there was a degree of deafness, considerable stupor, with occasional slight delirium. In the course of a few days the coats of the eye sloughed at the upper part, and its contents were evacuated. Whilst these changes were occurring in the eye, collections of matter formed without pain in different parts of the body, on both shoulders, above the insertion of the deltoid muscles, over the sacrum, &c. The constitutional disturbance abated, the collapsed eye healed over, but he never recovered his health. Five months subsequently he died, labouring under lumbar abscess, and worn out by hectic. On examination of the body, at which I was present, a portion of the jugular vein, to the extent of two inches, was found wanting; the upper and under extremities being shrunk, ligamentous, and gradually lost in the cellular substance. On opening the head, pus was found effused in great quantity between the tunica arachnoidea and pia mater, along the base of the brain, and the whole length of the spinal cord. The inter-muscular cellular substance of the loins was loaded with pus. The viscera of the abdomen and chest were not examined."

CASE II.—A man, twenty-five years of age, entered the New York Hospital, with exophthalmia of the right eye, due to a pulsating encephaloid tumour of

the orbit. On the 10th of May, 1857, Professor Van Buren tied the primitive carotid artery, and for a week every symptom promised well. On the eighth day, severe rigors occurred, followed by quick pulse, hot skin, sweats, prostration, and other evidences of pyæmia. The wound opened, and a thick, chocolate-coloured fluid was discharged, with occasional expulsion of large clots of blood on coughing. This continued until the death of the patient on the thirteenth day after the operation. On examination of the body, the wound presented a cavity of almost double its original extent; its walls were formed by dark sloughy tissue, "and at its bottom the ligature was found still slightly attached to what seemed to be a portion of the sheath of the vessels, the carotid artery having been entirely cut through, and its divided extremities retracted from each other to the distance of three-fourths of an inch." The artery was closed at both extremities, but "at a point opposite to the attachment of the ligature, and for the space of an inch in extent, the internal jugular vein was open, so that the handle of the scalpel could be readily passed into the vessel upward and downward; its coats having been destroyed throughout nearly half of its circumference by ulceration or sloughing." This lesion explained the symptoms of pyæmia, and the source of the discharge of clotted blood. "On examining the thoracic viscera, several abscesses as large as English walnuts were found in the substance of each of the lungs, and a number of smaller ones on their surface." (*New York Journal of Medicine*, July, 1857, p. 48.)

The mere Exposure of a Vein as a Cause of Diffused Phlebitis.—Another occurrence, fortunately infrequent, which may give rise to diffused phlebitis or pyæmia, is the laying bare of large deep veins, without any injury whatever to their coats, or the production of a mere bruise. On this subject, M. Broca, referring to the dangers of the operation for aneurism, writes:—

"Another accident, less frequent, but more serious than secondary hemorrhage, is purulent phlebitis of the vein which accompanies the ligated artery. This vein, often bruised during the operation, remains denuded at the bottom of a wound in which suppuration is almost inevitable, and it is easy to understand, under such circumstances, that it frequently becomes inflamed. Phlebitis is a very serious complication in itself, and much more so in the present case, because it is generally seated in a very large vein. When it becomes purulent, it gives rise to a purulent infection which is soon fatal; and when it is limited to obliteration of the vein by clots, it opposes to the circulation of the limb, already compromised by ligature of the artery, a new obstacle, which favours the production of gangrene." (*Des Anévrysmes et de leur Traitement*, p. 478. Paris, 1856.)

A case, of which the following is an abstract, demonstrating the truth of the remarks of M. Broca is narrated by Dr. James R. Wood, of New York, in his very interesting paper, "On Ligature of the Common Carotid Artery." Professor Post tied the common carotid for a large subcutaneous erectile tumour of the cheek. "In opening the sheath of the vessels, the deep jugular vein was not exposed. The patient appeared to be doing well for several days after the operation, after which he had rigors, with low delirium and irritative fever. He died, as nearly as I recollect, about the eighteenth day after the operation. On making the autopsy, the deep jugular vein accompanying the artery which had been tied, was found inflamed with pus in its cavity." (*New York Journal of Medicine*, July, 1857, p. 42.)

The following cases, presenting remarkable points of similarity, also bear directly upon the observations of M. Broca:—

CASE I.—Professor J. C. Warren, of Boston, removed the right clavicle for osteo-sarcoma. The subclavian vein was exposed in the whole extent of its course, as was also the lower third of the internal jugular. On the thirteenth day, the patient was seized with chills, the pulse rose from 80 to 112, he suffered

from great nervous agitation, and was slightly delirious. Death ensued on the 28th day. The post-mortem inspection showed the subclavian and jugular veins and the upper portions of the axillary and cephalic veins blocked up with firmly adherent coagula. The right pleural apex corresponding with the wound was covered with lymph, but the membrane was uninjured. The lower edge of the right lung was also the seat of lymph deposits, and the effusion was more considerable on the left side, with two or three spots nearly an inch in diameter, in the substance of the lung. The left pleural sac contained sanguinolent fluid. (*American Journal of the Medical Sciences*, Nov. 1833, p. 17.)

CASE II.—Professor Langenbeck removed the left clavicle for fibroid disease. The subclavian and internal jugular veins were exposed, and the former vessel was dissected off with difficulty. On the third day the patient, after a bad night, was seized with chills, and the pulse rose to 130. On the fifth day he was very restless, the intellect was clouded, the respiration short and quick, and he rapidly sank. The internal jugular vein was found to be occupied by a long, slightly adherent thrombus. The left pleura was not wounded during the operation, but was thickened by yellowish gray effused lymph, and the sac contained a very copious lymph exudation. (*Arch. für Klinische Chirurgie.* Band I. p. 8. Berlin, 1860.)

The True Danger from Ligating a Large Vein.—It is to be observed from the foregoing remarks that I have endeavoured to place the subject of venous deligation in its proper light, and demand for the ligature the same recognized position as a venous hemostatic agent, that it has acquired for the arrest of arterial hemorrhage. I have also, I think, adduced sufficient evidence, based upon tying the largest vein in the system to which surgical remedies are applicable, to prove that the fears of the production of diffused phlebitis, so much insisted upon by some authors, and so readily acquiesced in by a portion of the profession, are groundless. I have shown that pyæmia has resulted in but one case of the extirpation of a tumour of the neck in which the internal jugular vein was tied, and that the vein has been tied forty-one times; and also that pyæmia has followed five wounds of the internal jugular, for which there was either no treatment adopted, or the plan of treatment is not mentioned; that the same affection carried off two cases in which the vein had been transfixed by the thread in tying the common carotid artery; and, finally, that it was the cause of death in three operations in which the vein was simply exposed, a thrombus being present in the vessel in every one.

Since, then, pyæmia is not to be regarded as a cause of death after tying a vein, it may be asked what is the real danger attending the procedure? To this I answer it is precisely the same as that which results from arterial ligation, namely, *secondary hemorrhage,* coming on about the time of the separation of the thread. So preoccupied do authors appear to have been with the assumed danger of diffused phlebitis that they have not even mentioned secondary hemorrhage as a cause of death, and I was myself not at all aware of its frequency as a source of mortality, until I undertook the present investigation, which shows it to be eighty per cent. of all the fatal cases referable to the ligature.

The other dangers and inconveniences from tying veins are connected

with the state of the collateral circulation, and include gangrene below the seat of the ligature, apoplexy, softening of the brain, and other cerebral disorders, œdema, and dropsical effusions. The head affections will be alluded to in this paper, while the other dangers will be considered at a future time.

Wounds of the Internal Jugular Vein.—The internal jugular vein, continuous above with the lateral sinus, collects the blood from the interior of the cranium and the greater part of the head and neck. At its origin there is a dilatation, known as the sinus of the vein, and it is here closely adherent to the jugular fossa. Opposite the larynx its capacity is the greatest, the enlargement being the consequence of its having received several large branches; and it becomes somewhat contracted below, where it empties into the innominate vein. Upon its anatomical structure and relations, therefore, will depend the gravity of wounds inflicted upon it. The walls of the vessel are comparatively thin, its capacity is large, and the flow of blood through it is influenced by gravitation and by the absence of valves, so that there will be considerable regurgitation below.

If the vessel be divided in the inferior third of its course, the orifices will remain open, and its walls not collapse, owing to their connection with the deep cervical fascia, and here the danger to life from reflux bleeding and from the introduction of air, is greatest, the hemorrhage being more copious from the central or cardiac end during natural expiration, and during the convulsive motions of the expiratory muscles, as in crying, sneezing, and coughing. The introduction of air will take place during inspiration. Division of the vessel in its middle and upper thirds is not attended with equal danger, as the influence of the respiratory movements is not as much felt, and the walls of the vein have a tendency to fall together. Hemorrhage in these cases will occur from the peripheral or distal divided end, little, or no blood at all, flowing from the central extremity.

Should the vessel be injured near the base of the skull, fatal bleeding will ensue, provided there be a free external outlet; a recovery from a wound in this situation has not been recorded. It should also be taken into consideration that this vein, in common with the venous system at large, possesses very feeble contractile powers; and also that the capacity of the veins increases with age; so that, if wounded, the loss of blood will be greater in old persons and in debilitated constitutions, as in these conditions the capacity of the veins is much increased, whilst the arterial capacity is in a corresponding degree diminished.

From the above considerations it is to be observed that wounds of the internal jugular vein must be classed among the most dangerous and fatal of accidents. *Provided there be a free external opening for the escape of blood, they are equally as formidable as corresponding injuries of the*

carotid artery. In the latter case, should instantaneous death not ensue, the formation of a protective clot will be favoured by a state of syncope and by the contraction and retraction of the coats of the vessel. In the case of the jugular vein, fainting does not very materially assist coagulation, and the vessel does not contract. Add to this the dangers to life from the aspiration of air, the occurrence of phlebitis and pyæmia, with the following results, and my statement will prove to be correct. Cases of recovery from gunshot injury of the carotid artery are on record; but I have been unable to find a single example of similar lesion of the internal jugular vein attended with so happy a result. On the contrary, all the cases have proved fatal; 62.5 per cent. from secondary hemorrhage, 25 per cent. from pyæmia, and 12.5 per cent. from primary hemorrhage. All incised or punctured wounds, *not made by surgeons in operations*, have likewise ended in death; 50 per cent. from primary hemorrhage, and 50 per cent. from pyæmia. Of suicidal wounds there are eight examples, with two deaths and six recoveries; but of the latter, the ligature was employed in four, compression in two. The aspiration of air was the cause of death in four cases; the results of all other cases will be given under the head of treatment.

Wounds of the internal jugular do not differ from wounds in other tissues as regards the weapons with which they are inflicted, and may be incised, contused, punctured, lacerated, or gunshot. They are most commonly made by the surgeon in the extirpation of tumours of the neck; as in many of these cases the vein will be found to be intimately attached to the morbid growth, or imbedded in it, or displaced from its normal position, thus rendering it very liable to be opened. If the precaution be not taken to tie or compress the wounded vein, alarming hemorrhage, or death from the introduction of air, may ensue. Any one who has been unlucky enough to puncture or divide the vessel, cannot have failed to have been struck by the copious and embarrassing bleeding, and the difficulties of applying a ligature, particularly in the upper part of the neck.

Injuries of this vessel have occupied the attention of surgeons from time immemorial; and yet it is strange how few cases have been reported. Paulus Ægineta treats of them. Ambrose Paré, in his Chapter on "Wounds of the Neck," written upwards of three hundred years ago, says:—

"Celles des veines jugulaires et arteres carotides, estans grandes, sont mortelles, pource qu'elles ne peuvent estre estreintes et comprimées par ligatures, à cause que le col ne peut estre fort serré, qui l'on ne suffoquast le malade: au moyen de quoy s'ensuit un flux de sang, qui est cause de mort." (*Œuvres Complètes d'Ambrose Paré*. Par J. F. Malgaigne. Vol. ii. p. 90. Paris, 1840.)

And yet Paré narrates three cures by compression, which will be given in their proper place.

Dr. HENNEN, treating of injuries of the neck, uses the following language:—

"I omit saying anything on wounds of the jugulars, or carotids; gunshot openings of them I hold to be so universally fatal that any exceptions may be looked upon as merely serving to confirm the general rule. (*Principles of Military Surgery*, p. 286. Phila., 1830.)

As I have shown, Dr. Hennen was perfectly correct in this opinion; but the statement of Professor Boyer is remarkable:—

"When the large veins of the thoracic or abdominal cavities, and the internal jugular are wounded, the injury is beyond the resources of art and the patient dies of hemorrhage. Death has also supervened in the cases in which the internal jugular has been tied." (*Traité des Maladies Chirurgicales*, 5th edit., vol. ii. p. 422. Paris, 1845.)

The above statement of Professsor Boyer—and it occupies about as much space as authors generally devote to this injury—is perfectly gratuitous, and liable to mislead the reader. It is the more astonishing, as, at the time the sentence was written, not less than fifteen successful cases of ligation of the internal jugular had been reported, as well as several cures by compression.[1]

The following fatal cases, in which no treatment was employed, or the treatment is not mentioned, are separated into different classes for greater convenience of reference.

I. *Cases of Death from Primary Hemorrhage.*—The number of recorded cases of death from primary hemorrhage is very small, the following being the only ones that I have been able to discover:—

CASE I.—M. Vallée saw a soldier who had been stabbed in the neck, the right internal jugular vein being almost completely divided. The edges of the wound were retracted and the vein was empty. Death was almost instantaneous. (*Gazette Médicale*, p. 267. 1837.)

CASE II.—Mr. Bryant reported to the Pathological Society of London the case of a girl, nine years of age, who, one hour previous to her admission into Guy's Hospital, Nov. 1st, 1856, whilst carrying a chamber utensil in her hand, stumbled, and fell on the broken china. She bled freely at the time, and no other means than the application of adhesive plaster had been adopted. On admission she was pulseless and dying. There was a cleanly cut wound on the right side of the neck, one inch long and one inch external to the thyroid cartilage. There was no bleeding, but the child died in five minutes. On inspection it was found that the sharp edge of the broken china had made a clean V-shaped incision of the outer wall of the internal jugular, one-fourth of an inch in extent. (*Trans. of Path. Soc. of London*, vol. viii. p. 101. 1857.)

CASE III.—"During the summer of 1859, one of the inmates of St. George's Hospital committed suicide by cutting her throat. She was almost immediately seen by the house surgeon, but had already ceased to breathe, and was quite

[1] It may here be remarked that some cases of ligation of the internal jugular vein have been incorrectly reported. Thus M. Velpeau gives Professor Miller, of Kentucky, the credit of having cured a patient by the ligature; whereas that gentleman ligated the primitive carotid and suppressed the venous hemorrhage by compression. Professor Henry Smith, of this city, states, in his work on surgery, that the late Dr. Randolph tied the internal jugular during the extirpation of the parotid gland. The external jugular was the vessel involved. I have been very careful to avoid such errors by referring to the original reports, which have in most instances been accessible.

pulseless. There was a deep gash in her throat, dividing the left common carotid artery, and wounding both internal jugular veins." (Mr. Henry Gray. *Holmes' System of Surgery*, vol. ii. p. 277. London, 1861.)

CASE IV.—Mr. Samuel Cooper has recorded a remarkable and unique case of death from primary subcutaneous hemorrhage. The patient, a soldier, had been shot, the ball entering behind the mastoid process, and passing downwards and forwards towards the sternum. The internal jugular was divided; the man lived for more than an hour, but was suffocated by the pressure of the large mass of extravasated blood on the trachea. (*First Lines of the Practice of Surgery*, vol. i. p. 529. New York, 1822.)

II. *Cases Fatal from the Introduction of Air.*—Wounds of this vein have been attended with the introduction of air in eleven instances, four of which were fatal. The cases of Wattman, Asmus, Brodie, and Morton, recovered, as will be seen in table No. II., although ligatures were applied to the vein. The case of Dr. Smith recovered from the effects of air, but died of exhaustion on the tenth day. The cases of MM. Velpeau and Bégin, referred to under the head of treatment by compression, resulted in a prompt cure. In ten of these cases the vein was injured during the removal of tumours, and in the eleventh the vessel had been divided in a suicidal attempt. It will thus be observed that the introduction of air was, in every case, the result of an incised wound, and after a very careful examination of a large collection of works on military surgery, I can safely state that there is not a single recorded instance of death from this accident following a gunshot injury.

In the following fatal cases, death occurred, in two, almost instantaneously; in one, in three hours and a half; and, in the fourth, after the lapse of seven days:—

CASE I.—Dr. Ulrich, of Berlin, 1834, divided the internal jugular in removing a tumour from the side of the neck. Not a drop of blood flowed, although the vessel remained patulous, and the assistants heard a whizzing sound. Soon, however, frothy blood welled from the inferior extremity; syncope ensued, with convulsive movements of the face and opisthotonos. The countenance became pale, the pulse small and tremulous, the respiration slow, and the man died at the expiration of a minute. On dissection, fifty-two hours after death, the vein was found imbedded in the tumour and obliterated a little above the point of its division. The right auricle was elastic and distended, and contained no blood. The blood of the right ventricle was fluid and black. (*Compendium de Chirurgie Pratique.* Par MM. Bérard et Denonvilliers, vol. i. p. 80. Paris, 1840.)

CASE II.—M. Gorré, of Bologne, 1842, in the removal of a cancerous growth of the left side of the neck, when he was dividing the last attachments, heard an unmistakable *glouglou*. The patient grew pale, the breathing was accelerated, and he died in about one minute. A post-mortem examination was made at the expiration of twenty-four hours, when the internal jugular was found to be opened about eight lines above the clavicle. The wound was oblique, about three lines long and gaping, and on compressing the vein from below upward, gave issue to spumous blood. The right auricle and ventricle, the superior vena cava, subclavian, axillary, brachial, and superficial veins of the brain contained blood mixed with air. (*Annales de la Chirurgie Française et Etrangère*, vol. vi. p. 305.)

CASE III. M. Mirault, of Angers, 1837, wounded the internal jugular, whilst separating a fibrous tumour of the right side of the neck from its deep connec-

tions. A whizzing sound was distinctly heard, repeated in a few seconds, when the face became livid, and there was a general trembling, with tetanic convulsions. The wound was filled with black blood, and the patient had ceased to respire. A ligature was thrown around the vein, and, after the lapse of eight minutes, under appropriate measures, the patient completely recovered and the operation was finished, about eight ounces of blood having been lost. The vein had been divided to the extent of one-half of its calibre, about an inch and a half above the clavicle. The patient was placed in his bed; his voice was weak, and his respiration a little lowered. Intense chilly sensations soon came on, and, at the end of three hours, M. Mirault found him presenting all the signs of suffocation, in which condition death ensued in about ten minutes. An autopsy was denied. (*Comp. de Chir. Pratique*, vol. i. p. 80.)

CASE IV.—M. Roux, 1832, divided the internal jugular in the removal of a tumour from the parotid region. Air was heard to enter the vein with a whistling sound, the breathing became much embarrassed, and the patient, a girl, was strongly convulsed. The vein was compressed, and, under the use of stimulants, she shortly recovered. Two ligatures were thrown around the tumour, which was not extirpated at the time, but on the sixth day, having become disintegrated, it was easily removed. On the following evening she died in a state of coma. On post-mortem inspection the internal jugular was found to be divided, the cavities of the heart were empty, and the aorta and iliac arteries contained air. The venous system presented no abnormal appearances. (*Gazette Médicale*, 1833, p. 498.)

Gunshot wounds of the internal jugular, if not immediately fatal, as they are very apt to be, are exceedingly liable to be followed by secondary hemorrhage and pyæmia, which usually terminate in death. In fact, I have not met with a single example of these injuries where the vein alone was involved, followed by recovery. Five of the seven cases here recorded proved fatal from secondary bleeding, in a period varying from four to fifteen days, and two died of purulent infection.

III. *Cases of Gunshot Wound Fatal from Secondary Hemorrhage.*

CASE I.—In April, 1849, Dr. Stromeyer had a case of gunshot fracture of the lower jaw, the bullet entering near the chin on the left side, and driving the spicula deep into the throat. "When I first saw him he was in imminent danger of suffocation, from which I freed him, by removing, by means of the left index finger introduced into the mouth, many large and sharp fragments from the neighbourhood of the larynx. He died suddenly on the fourth day, in the presence of his attending physician, a thick stream of dark blood issuing from the mouth." Warm poultices had been substituted for cold applications contrary to Dr. Stromeyer's orders. The autopsy showed an opening in the internal jugular vein, made by a splinter of bone, which still remained in it. (*Maximen der Kriegsheilkunst*, 2d edit. p. 131. Hanover, 1861.)

CASE II.—Professor Langenbeck relates the case of a young man, who was shot in a duel with pistols. The ball, which entered the mouth from right to left, shattered two teeth, broke the ramus of the jaw, and was perceptible on the left side of the neck. A copious hemorrhage of short duration followed. On the eighth day, secondary hemorrhage by the mouth suddenly carried the patient off: on inspection of the body, the left internal jugular was found to be torn. (*Archiv für Klinische Chirurgie*, vol. i. p. 22. Berlin, 1860.)

CASE III.—Dr. Hennen has recorded the following case: "A soldier of the Brunswick Oels., was struck at Waterloo by a musket ball on the tip of the nose, which split upon the bony edge where it is joined by the cartilage. A piece of the ball was extracted upon the spot, and it was supposed that the ball

itself had been purposely cut into pieces, as is sometimes done by foreign riflemen. On the 10th day the man was seized with a violent hemorrhage from the mouth and nose, which came on suddenly, and carried him off in the course of the night. On dissection, it appeared that a very minute portion of the ball had penetrated along the basis of the skull, lodged in the sinus of the left internal jugular vein, forming a sort of sac for itself close upon the vein, which, having inflamed the coats of the vessels, at last ulcerated and burst. The case occurred in the practice of my friend Dr. Pockels, now Surgeon-in-chief of the troops of Brunswick." (*Principles of Military Surgery*, p. 90. New York, 1830.)

CASE IV.—M. Jobert de Lamballe, treating of gunshot wounds of the neck, mentions a case of M. Delpech, who cured a man of wound of the primitive carotid, too low down to be tied. Secondary hemorrhage ensued, and Delpech employed Valsalva's treatment. The patient was bled very frequently, and ultimately recovered. "In a similar case, I imitated Delpech. Indeed, I was congratulating myself upon having followed his example in a man who, in the disturbances of July, was shot, the ball wounding the primitive carotid and the internal jugular vein of the right side. Venesection frequently repeated had already notably diminished the amount of blood which escaped from the wound at different times: fifteen days had elapsed since the reception of the wound; I had great hopes; but in consequence of a violent effort on the part of the patient, a frightful hemorrhage produced death." (*Plaies d'Armes à Feu*, p. 159. Paris, 1833.)

CASE V.—"A wound from firearms proved fatal in fifteen days; the autopsy disclosed a communication between the internal jugular vein and the carotid artery. The ball was underneath and in the jugular itself. I have seen the specimen." (Prof. Velpeau. *New Elements of Operative Surgery*, vol. i. p. 860. New York, 1856.)

IV. *Cases of Gunshot Wound Fatal from Pyæmia.*

CASE I.—Dr. Schwarz met with a case in which a rifle ball had entered the mouth, shattered the left lower jaw, and penetrated the neck, tearing the internal jugular vein to the extent of a few lines. The missile remained at the opening of the vein, and therefore permitted the escape of only a few ounces of blood into the surrounding tissues. It was not removed, although it was felt in the swelling. Suppuration ensued, with death from pyæmia.

An autopsy showed a completely healed rent in the outer wall of the vein, the cylinder of which was slightly diminished but free. At the cicatrice the coats of the vein were thickened by plastic deposits, and a very adherent, semi-organized layer of lymph coated the lining membrane. The small veins in the neighbourhood of the abscess, in which the ball lay, were filled with broken-down coagula. (*Archiv für Klinische Chirurgie*, vol. i. p. 23.)

CASE II.—On the taking of Colding, Dr. Stromeyer saw a Schleswig-Holstein soldier who had been shot in the right side of the lower jaw in front of the insertion of the masseter muscle. The ball found its way under the tongue and the left side of the lower maxilla, behind the sterno-cleido-mastoid muscle, where it was felt on a level with the top of the larynx, but was not removed. There had been no hemorrhage. The patient died at the expiration of three weeks of pyæmia.

On the autopsy, an abscess was found behind the left sterno-cleido-mastoid muscle, in which lay the flattened bullet near to the vertebral column. "The internal jugular vein had been torn to the extent of five lines on its anterior and outer aspect; but the rent was completely healed, as the coats of the vein had applied themselves to it behind, and were united, so that the cylinder of the vessel was diminished one-half." (*Maximen der Kriegsheilkunst*, p. 132.)

V. *Cases of Incised and Punctured Wounds Fatal from Pyæmia.*

CASE I.—A boy, four years of age, on the 25th of November, 1834, fell upon the blade of a penknife, which entered his neck over the seat of the great ves-

sels, just back of the thyroid cartilage. Dr. Bartlett saw him about five minutes after the accident, and found venous blood flowing in a full stream, the quantity lost, by estimation, being ten ounces. The bleeding was arrested by a moment's compression with the finger, and nothing more was done than to apply a bit of adhesive plaster. On the 29th, the neck was tender to the touch and a little swollen. The boy was restless and feverish, and he was placed upon the use of the antimonial and saline mixture, and a lotion of alcohol and water was applied to the neck. Dec. 1st. Had been leeched. At 10 A. M. had a severe chill, short, quick breathing, and frothing at the mouth; low, muttering delirium during the night; lips dry and some sordes on the teeth. Dec. 3d, 10 P. M. Death during a paroxysm of chills.

On dissection it was found that the internal jugular had been penetrated by the knife. Between the vertebræ and the sheath of the vessels an abscess had formed, containing six ounces of pus, and extending from an inch above the wound as low down as the clavicle. Coagulated blood was found in the sheath as low down as the pericardium. The wounds in the vein were closed by adhesive inflammation, and the cylinder of the vessel was so much contracted at that point, as to admit of the passage of a little more than an ordinary probe. "For the space of two inches below the wound, there was some appearance of ulceration within the vein; and it contained a firm, strong white cord of coagulum, extending from the wound into the right ventricle of the heart. This was so large as nearly to fill the jugular vein, and in many places adhered pretty firmly to it. The third or half of the pericardium next the base of the heart, showed marks of high inflammation." (*Amer. Jour. Med. Sci.*, Aug. 1835, p. 357.)

Case II.—M. Tacheron reports the case of a woman who was stabbed with a poniard in the root of the neck. Profuse hemorrhage ensued, and a tumour of the size of an egg, formed. Symptoms of pyæmia set in, and death occurred on the fifteenth day. The autopsy disclosed an abscess behind the carotid and internal jugular, and the latter presented a round opening, two lines in diameter, in its posterior wall. At this point a yellow fibrinous clot obliterated the interior of the vessel, and the clot, which contained a puriform fluid, extended down the jugular into the right auricle, where it expanded into a rose-colored and organized coagulum. Pleurisy existed on the left side. (*Gaz. Méd.*, p. 203. 1837.)

Case III.—Specimen 1521[55] of the Museum of Guy's Hospital, London, shows a "jugular vein, exhibiting a wound occupying about half its circumference, and situated about half an inch above the subclavian; the neighbouring branches showing effects of phlebitis."

"James F., aged 30, under Mr. Birkett. He received a stab with a knife on the left side of the neck, piercing the sterno-cleido-mastoid muscle near its origin, by which the jugular was wounded. Much hemorrhage followed and continued for several days, when symptoms of phlebitis set in, and he died of pneumonia twenty days after the accident. The vein was found wounded as here seen, its coats infiltrated with lymph, and the interior filled with fibrin; lungs filled with abscesses." (*Catalogue of the Pathological Preparations of the Museum of Guy's Hospital.* Edited by Dr. Wilks, vol. i. London, 1863.)

VI. *Cases of Wounds Fatal from Other Causes.*—In addition to the above-mentioned observations, two additional cases are recorded of wounds of the internal jugular vein, in both of which neither secondary hemorrhage nor pyæmia was the cause of death.

Case I.—Professor Gross, on the 14th of September, 1846, was called to a lad fourteen years of age, of a scrofulous constitution, who had been wounded by the accidental discharge of a fowling-piece, a portion of the load, which consisted of large squirrel shot, entering the neck at four or five different points. The wounds were attended with little hemorrhage, and the patient soon recovered from the shock. For a time everything progressed favourably; the wounds of the neck healed without any application, when suddenly, thirteen days after the

accident, and without any premonitory symptoms, the patient was seized with a protracted epileptic convulsion, chiefly affecting the left side, and died the following day without any return of consciousness.

Autopsy.—The shot which had entered the region of the right jugular and carotid, had perforated the anterior wall of the former vessel, and lodged on the inner surface of the opposite wall, where it had become completely encysted. The vein bore no evidence of inflammation; its cavity, however, was somewhat diminished by the projecting cyst; the opening in front was perfectly closed, and there was no external nor internal clot.

A shot had perforated the trachea and œsophagus, and was imbedded in the cartilage between the third and fourth cervical vertebræ. The openings were closed, with the exception of the one in the posterior wall of the œsophagus, which was separated from the spine by an abscess extending from the second to the seventh cervical vertebræ, and containing six drachms of scrofulous pus. One shot had perforated the subclavian artery and lodged in the first rib. The calibre of the vessel was unimpaired, and the openings were closed by small clots extending around the outside of the vessel, upon the removal of which the margins of the wounds appeared as if they had just been inflicted. The artery presented no marks of inflammation. The brain and spinal cord were free from morbid appearances, except a little serum in the lateral ventricles of the former. (*Amer. Journ. Med. Sciences*, p. 355. April, 1848.)

Case II.—Dr. John H. Packard narrates the case of a man twenty-six years of age, of intemperate habits, who was admitted into the Pennsylvania Hospital on the 3d of November, 1855. He had been stabbed ten hours previously just below and behind the left ear, and was covered with blood. The hemorrhage had, however, ceased, and a tumour with much ecchymosis had formed. Cold water was applied, and five days subsequently there was some bleeding from the wounds and the tumour was found to be the seat of pulsation and somewhat diminished in size. On the 10th, Dr. Norris ligated the common carotid with the effect of arresting the pulsation; and on the 19th erysipelas set in, but subsided in a week. Death ensued from softening of the brain on the 6th of December.

A post-mortem inspection showed a sac occupied by a clot of blood in front of the upper cervical vertebræ, on the inner surface of which were three openings, the largest being that of the distal extremity of the divided internal jugular vein, while the other two corresponded to the almost divided occipital artery. The vein was much contracted and perfectly occluded for about half an inch on the cardiac side of the sac, and the common carotid artery was plugged up with firm coagula. The brain was somewhat softened throughout, with effusion into the ventricles. The cerebral tissue of the superior and anterior portion of the left hemisphere and of the posterior portion of the right hemisphere was broken down into a pasty mass. (*Amer. Journ. Med. Sciences*, p. 396. April, 1856.)

Remarks.—The foregoing twenty fatal cases present many points of interest, and demonstrate that wounds of the internal jugular vein are by no means to be considered necessarily mortal from primary hemorrhage, that issue having occurred in but twenty per cent. of the cases. In one of these death was almost instantaneous, the vein having been divided to the extent of one-half its calibre. In the second, the patient lived a little more than an hour, the wound having been oblique and gaping, and of about three lines in extent. In the third, both veins and the left carotid were wounded, resulting in instantaneous death; and in the fourth, the vein was completely divided, and the hemorrhage proved fatal in one hour.

Of the cases in which the introduction of air into the circulation was the cause of death, the first and second were fatal in one minute, the vein,

in one, having been completely divided, in the other it was opened to the extent of three lines. In the third case, the patient died in three hours and a half, the calibre of the vein having been divided one-half; and in the fourth, there was complete division with a fatal issue on the seventh day. Secondary hemorrhage, as a result of gunshot wounds, occurred in the five cases, respectively, on the fourth, eighth, tenth, and in two, fifteenth day.

Pyæmia resulted from gunshot wounds in two cases, one on the twenty-first day, the date of the other not being given. It was also the cause of death in three instances of incised wounds, on the eighth, fifteenth, and twentieth days respectively.

In the remaining two cases, the fatal issue was due, in one, to epilepsy, in the other to softening of the brain from ligation of the carotid artery.

Primary hemorrhage was prevented in the first case of Dr. Stromeyer by a splinter of bone, which had been driven into the vessel, and formed a mechanical obstacle to the flow of blood until loosened by suppuration. In the patient of Dr. Schwarz there was no external bleeding, the ball remaining at the opening of the vein, permitting the escape of but a few ounces of blood into the surrounding tissues. In Dr. Stromeyer's second case there was no hemorrhage, but had the ball been removed by incision, the patient would have been exposed to this danger as well as to the introduction of air. In the case of M. Velpeau the ball was partly in the vein, and in the absence of a satisfactory history we may presume that death resulted from secondary bleeding.

That *spontaneous union* of the lips of the wound, by the efforts of nature alone, may occur, is beautifully illustrated by the case of Professor Gross, which is rendered more interesting from the fact of the shot having become encysted in the interior of the vessel. In Dr. Schwarz's case, fatal from pyæmia, the rent in the vessel, of several lines in extent, had completely closed. At the cicatrice, the coats of the vein were thickened by plastic effusion, and a semi-organized layer of lymph was deposited on the lining membrane. The case of Dr. Bartlett showed the wounds healed, but the cavity of the vessel nearly obliterated; and the case of Dr. Stromeyer is interesting from the mode of healing, the wound, five lines long, adhering to the posterior and inner surface of the vessel, diminishing its calibre one-half.

In all these cases an abscess was present posterior to the sheath of the vessels, and in front of the cervical vertebræ.

For convenience of reference the foregoing cases are presented in the annexed table, from which it will be perceived that the causes of death were in the following ratio: introduction of air, 20 per cent.; primary hemorrhage, 20 per cent.; pyæmia, 25 per cent.; secondary hemorrhage, 25 per cent.; and other causes, 10 per cent.

TABLE I.—*Fatal Cases of Wounds of the Internal Jugular Vein.*

Case.	Surgeon.	Authority.	Cause of death.	Period of death.	Injury and extent of wound of vessel.	Vein affected.
1	Vallée,	Gaz. Méd. de Paris, p. 269. 1837	Primary hemorrhage	Instantaneous	Almost complete division; stab in neck	Right jugular.
2	Bryant,	Trans. Path. Soc. London, vol. viii. p. 101. 1857	Primary hemorrhage	1 hour and 5 minutes	One-fourth of an inch. Fall on broken china	Right jugular.
3	Gray,	Holmes System of Surgery, vol. ii. p. 277. London, 1861	Primary hemorrhage	Instantaneous	Incised in suicide; both veins & left carotid artery	Both jugulars.
4	S. Cooper,	Practice of Surgery, vol. i. p. 529. New York, 1822	Primary hemorrhage and suffocation from pressure on trachea	A little more than an hour	Complete division; gunshot wound	
5	Ulrich,	Compendium de Chir. Pratique, vol. i. p. 80. Paris, 1840	Introduction of air	1 minute	Complete division in removal of tumour	
6	Gorré,	Annal. de la Chirurgie Française et Etrangère, vol. vi. p. 305	Introduction of air	1 minute	Three lines and oblique. Removal of tumour	Left jugular.
7	Mirault,	Comp. de Chir. Prat., vol. i. p. 80	Introduction of air	3½ hours	Half its calibre in removal of tumour	Right jugular.
8	Roux,	Gaz. Médicale, 1833, p. 498	Introduction of air, coma	7 days	Complete division in removal of tumour of neck	
9	Stromeyer	Max. der Kriegsheilkunst, 2d ed., p. 131. Hannover, 1861	Secondary hemorrhage	4th day	Gunshot splinter of bone driven into vessel.	Left jugular.
10	Langenbeck	Archiv für Klin. Chir., vol. i. p. 22. Berlin, 1860	Secondary hemorrhage	8th day	Gunshot; vein torn	Left jugular.
11	Hennen,	Princip. of Mil. Surg., Am. ed., p. 90. New York, 1830	Secondary hemorrhage	10th day	Gunshot, followed by ulceration	Left jugular.
12	Jobert de Lamballe	Plaies d'Armes a Feu, p. 159. Paris, 1833	Secondary hemorrhage	15th day	Gunshot, involving common carotid artery	Right jugular.
13	Velpeau,	Operative Surg., Am. ed., vol. i. p. 80. New York, 1856	Secondary hemorrhage	15th day	Gunshot, involving common carotid	
14	Schwarz,	Archiv für Klin.-Chir., vol. i. p. 23	Pyæmia	....	Gunshot	Wound of vein had united.
15	Stromeyer,	Maxim. der Kriegsheilkunst, p. 132. Hannover, 1861	Pyæmia	21st day	Gunshot, five lines	Left jugular, wound united.
16	Bartlett,	Am. Jour. Med. Sci., vol. xvi. p. 357. 1835	Pyæmia	8th day	Punctured by penknife	Wound united.
17	Tacheron,	Gaz. Médicale, 1837, p. 203.	Pyæmia	15th day	Stab with poniard; two lines	Wound open.
18	Birkett,	Catalogue of the Pathological Preparations of the Museum of Guy's Hospital, vol. i. London, 1863	Pyæmia	20th day	Stab with a knife; half of circumference	Left jugular, wound open.
19	Gross,	Amer. Jour. Med. Sci., April, 1848, p. 355	Epilepsy	14th day	Punctured by small shot	Right jugular, wound united.
20	Packard,	Amer. Jour. Med. Sci., April, 1856, p. 396	Softening of the brain	33d day	Stab, involving occipital artery	Left jugular, wound open.

Arterio-Venous Aneurism of the Internal Jugular Vein.—Wounds of the internal jugular vein, when complicated with similar injuries of the carotid artery, do not always prove fatal, either at once or secondarily, but may result, under favourable circumstances, in the formation of arterio-venous aneurisms. The prognosis of these cases is less serious than when the artery alone has been injured, as a portion of the blood of the latter penetrates the vein; a tumor composed of effused blood forms in the surrounding tissues, and the hemorrhage is arrested, and the cure effected by the

almost unaided efforts of nature. I have been able to collect nine examples of this affection, seven being referable to aneurismal varix, and two to varicose aneurism. In five the communication existed between the primitive carotid artery and internal jugular vein, and in four between the latter and the internal carotid. In none did the affection appear to shorten life, or produce much inconvenience. In the cases of Baron Larrey—the first on record—as well as in the one narrated by Dr. Marx, the formation of the aneurismal varix was favoured by the mode of production of the wound; they were the result of sword thrusts which divided the sterno-cleido-mastoid muscle in the direction of its fibres, so that when the weapon was withdrawn, the wounds did not gap. In all the cases syncope from loss of blood, by favouring the coagulation of that fluid, materially added to the fortunate issue.

CASE I.—A sub-officer, on the 23d of September, 1821, was wounded by a short sword immediately above the sterno-clavicular articulation. The sternal origin of the sterno-cleido-mastoid muscle had been cut in a longitudinal direction, to the extent of half an inch, and the right internal jugular vein and primitive carotid artery, near its origin from the innominate, had been punctured. A very copious hemorrhage ensued, and the surgeon of the corps with difficulty arrested it.

The patient was brought to the hospital and the dressings were carefully removed. Baron Larrey found the edges of the wound agglutinated by a black coagulum, and a pulsating tumour had formed, of the size of the fist, accompanied with a peculiar bruit. The man was speechless, weak, and pale, and in a state of stupor. The wound was dressed with adhesive strips, and covered with a bladder filled with ice.

In the evening the pulse and warmth of surface had returned; the external jugular vein pulsated and was much enlarged; and the man was bled from the arm. On the fifth day the pulse was very frequent, and there was intense cephalalgia, for which the temporal artery was opened, and leeches applied to the nucha and between the shoulders. On the tenth day the tumour began to diminish, and had disappeared on the sixtieth day after the accident, when he returned to duty. The varix, however, remained. The treatment consisted in repeated withdrawals of blood by opening a vein and by leeches, in the continuous application of ice to the tumour, and the exhibition of cooling drinks. (*Clinique Chirurgicale*, vol. iii. p. 149. Paris, 1829.)

CASE II.—This case was analogous to the preceding. The man entered the hospital, April 5th, 1822, to be treated for a small wound on the lower portion of the right side of the neck, accompanied with an ovoidal tumour of an aneurismal nature. Both resulted from simultaneous perforation of the walls of the jugular vein and the carotid artery, produced by a sabre thrust. The symptoms were not so well marked as in the preceding case, on account of the arterial lesion being smaller. The treatment was precisely similar, and the man returned to duty at the expiration of two months. (Ibid., p. 154.)

CASE III.—A gentleman was wounded in a duel, the point of the sword entering above the inner end of the right clavicle, and inflicting a wound half an inch long. Arterial blood escaped in a full and continuous jet, which the patient himself arrested by placing several folded handkerchiefs over the cut and retaining them in position by another carried around the neck. He walked to a hospital in the vicinity, which required thirty minutes; but on his way, feeling weak, he stopped at a tavern to take a glass of wine, where he fell into a state of partial syncope. When he arrived at the hospital, the surgeon brought the edges of the wound together with adhesive strips, and placed him on a rigorous

diet. At the expiration of five days the wound had united, and the patient returned home, with a small pulsating tumour, attended with a bruit. It gradually disappeared and gave him no inconvenience.

Twenty years after the accident, Dr. Marx presented the man to the Academy of Medicine, when he had all the signs of an aneurismal varix. (*Mémoires sur l'Anévrysmes.* Par M. Breschet. *Mémoires de l'Académie Royale de Médecine*, vol. iii. p. 233. Paris, 1833.)

CASES IV.–V.—Two other cases of traumatic aneurismal varix of the common carotid and internal jugular vein are recorded: one by Williamson,[1] the result of a sabre wound above the clavicle; the other by Rigaud,[2] the lesion having been produced by a very fine splinter of glass.

CASES VI.–IX.—MM. Joret, Desperanches, A. Bérard, and Giraldès have each observed a case of arterio-venous aneurism between the internal jugular vein and common carotid artery; and in two of the cases in which an autopsy was held, an aneurismal sac existed between the vessels. The wound was produced in two cases by a ball, in one by a particle of lead, and in the fourth by a shoemaker's knife. In the case of M. Giraldès the projectile was found in the aneurismal sac.[3]

In the next number of this journal the subject of this paper will be completed, by some observations on the treatment of wounds of the internal jugular vein for the arrest of hemorrhage, and the prevention of the introduction of air.

PHILADELPHIA, October, 1866.

ART. II.—*On Internal Aneurism, and its Relation to Sudden Death, with an account of ten cases in which the existence of that disease was not suspected prior to the death of the subject, from rupture of the sac; to which is appended a Practical Discussion concerning the Diagnosis and Treatment of Aortic Aneurism.* By JOHN A. LIDELL, M. D., of New York.

IN the time of our predecessors, when a person in full flesh, and seemingly free from disease of any serious nature, happened to fall down suddenly, without apparent cause, and immediately expire, it was usually said that the death was occasioned either by *apoplexy*, or by *disease of the heart.* Indeed, the term apoplexy had its origin far back in Grecian antiquity, in one of the most striking of the circumstances mentioned above; for the victims of that disease generally fall down suddenly, as if stricken by a powerful blow. But pathological investigations of an anatomical character, especially those of a recent date, have abundantly shown that there are other causes of sudden death, unconnected with wound, or violence, or poison, besides the anatomical lesions of the brain and heart, and that

[1] Sabatier par Dupuytren. De la Méd. Oper., vol. iii. p. 188. Paris, 1832.
[2] Follin. Traité Elémentaire de Path. Ext., vol. ii. p. 411. Paris, 1863.
[3] Ibid., p. 413.

among these additional causes of sudden death internal aneurism stands very prominent, on account of the frequency with which it produces such a result, through rupture of the aneurismal sac, and extravasation of blood therefrom.

The term internal aneurism is employed as an antithesis to that of external or surgical aneurism. This disease is called surgical, when it is located in the extremities, or in any other part of the body, permitting the employment of surgical treatment for its relief; for example, the neck, axillary, and inguinal regions. But it is called internal aneurism when it is located deep within the body, and generally in such parts thereof as do not allow the employment of surgical treatment; such, for example, as the cavities of the thorax, abdomen, and cranium. When this affection is developed within the thorax, it proceeds from either the aorta, or from the great vessels which are given off from the arch of the aorta, namely, the innominata, the left carotid, and left subclavian (before the two arteries last named have emerged from the thorax, of course), or from the pulmonary artery—generally a branch thereof—or, in very rare instances, from one of the coronary arteries of the heart. When this disease is situated within the abdomen, it involves either the aorta or its branches, such as the cœliac axis, the hepatic and splenic, the superior mesenteric, and the renal arteries, or the primitive iliacs. Aneurisms of the external and internal iliacs are generally considered as external, because they are amenable to surgical or operative treatment. Finally, aneurism occurring within the remaining one of the great cavities of the body, the cranium, has occasionally been met with, being developed from either the basilar or the internal carotid, or one of the cerebral arteries.

The aorta, however, is the seat of internal aneurism in a large majority of all the cases in which that form of the disease occurs. Aneurisms of the pulmonary, coronary, hepatic, splenic, mesenteric, renal, basilar, and cerebral arteries, are affections that appear but very rarely (at least I have seen but one instance in more than 2000 autopsies), and aneurisms of the innominata, the left carotid, and left subclavian arteries within the thorax, and the primitive iliacs are—excepting the innominata—not often met with. In 551 cases of aneurism tabulated by Dr. Crisp, the arteria innominata was the seat of the disease in 20 instances, the common iliac in but 2, the pulmonary artery in but 2, the arteries of the brain in 7, while the abdominal aorta and its branches were involved 59, and the thoracic aorta 175 times. (*Crisp on Diseases of the Bloodvessels*, pp. 113 and 127.) It is also probable, for reasons which will be stated in the sequel, that the relative frequency with which aneurism of the thoracic aorta occurs is not fairly represented by Crisp's table, and that, in reality, this disease has its seat in that portion of the arterial system much oftener than said table would lead us to suppose.

But not all parts of the thoracic aorta are equally exposed to the occur-

rence of aneurism. It is developed most frequently in the ascending portion of that vessel. It is met with next in point of frequency in the transverse part of the arch; and, in general, proceeding beyond the arch, the more distant from the heart any portion of the aorta is, the less also is its liability to become affected by aneurism. There are several reasons, however, why this disease is developed much more frequently in the ascending and transverse portions of the aortic arch than in any other part of the arterial system. 1. The ascending portion of the aorta is embraced within the pericardial cavity, and is directly covered or invested only by a thin serous membrane, continued on to it from the heart, and not by a tough fibrous sheath, such as belongs to arteries in other situations. The walls of the ascending portion of the aortic arch, being thus not supported or strengthened by the presence of a sheath, are peculiarly liable to give way and become the seat of aneurism.

2. The impulse of the blood produced by contraction of the left ventricle of the heart acts more powerfully upon the arterial tunics in the portions of the aorta which are near to the great central organ of the circulation than in the parts which are remote from it; and, speaking generally, we may say that the degree of outward pressure exerted upon the walls of the aorta by the contractions of the left ventricle of the heart diminishes as the distance from that organ increases.

3. The transverse portion of the aortic arch is particularly exposed to the occurrence of aneurism, because the current of the blood, as it is forced through the vessels by the contractions of the heart, sets strongly against the distal side, or the convexity, of the curvature of that arch. The impulse of the blood is therefore felt more strongly in the upper and posterior portion of the aortic arch than elsewhere, and thus a special tendency is established for the formation of aneurisms in that situation.

Aneurismal tumours developed from the ascending aorta attain a large size in but a small proportion of the cases, and generally terminate in sudden death from rupture of the sac and extravasation of blood into the cavity of the pericardium. The walls of such aneurisms are liable to give way at an early period in the history of the disease, because they are not strengthened by the coalescence with them of any arterial sheath, or any considerable planes of connective tissue. The rent in the walls of such aneurisms generally, or, indeed, almost always, takes place into the pericardial cavity, because the ascending portion of the aortic arch lies within that cavity, the fibrous layer of the pericardium uniting itself with the aorta at the commencement of the transverse portion of the arch, and becoming continuous with its sheath and external coat at that point. Six cases, in each of which an aneurism of the ascending aorta burst into the cavity of the pericardium will be narrated in the sequel. Such subjects always die instantaneously, or nearly so, and are generally supposed to perish from disease of the heart, unless the real cause of death is ascertained

by making an autopsy. The victims of this variety of aortic aneurism are, for the most part, met with, not among the inmates of our general hospitals, but among those who, while engaged in their daily avocations, suddenly fall down and immediately expire, or are unexpectedly found lying dead in their workshops and other places of business. They have generally been supposed to be in the enjoyment of a fair degree of health up to the time of their sudden demise, although they not unfrequently complain of pain and oppression in the chest, and of other symptoms produced by their disease which are usually referred to anything but the real cause. Such cases come under the administration of the coroners in this city, and are not likely to attract the surgeon's attention, unless he is specially engaged in ascertaining the causes of sudden death occurring among persons apparently in usual health. The pathological anatomist who forms his opinion with regard to the relative frequency of the occurrence of aneurism in the ascending portion of the aorta, solely from what he has seen in the dead-house of a general hospital, will greatly err, because the victims of that form of the disease comparatively seldom enter any hospital. Furthermore, I am convinced from personal observation and experience that no inconsiderable share of the cases that die suddenly without medical attendance and without any obvious cause, such as violence, poison, intemperance, etc., would constitute, and wherein—no autopsy being made—the death is supposed to have been produced either by apoplexy or by disease of the heart, die in reality from an unsuspected aneurism of the aorta, and that, in a considerable majority of these cases, the aneurism is located in the ascending portion of the aortic arch. For example, in *ten* cases belonging to this category that have come under my own notice, and wherein autopsies were held (in nine of them the post-mortem examination was made by myself, and in the remaining instance the pathological specimen was shown to me directly after its removal from the subject), the aneurism was found to be located in the ascending portion of the aortic arch in *eight* instances, in the thoracic aorta in *one* instance, and in the abdominal aorta in the remaining instance. Of these ten cases of aortic aneurism in which death occurred suddenly and unexpectedly to all concerned, the history of nine, or those whereof I made the autopsy, will also be narrated in this essay.

With regard to the relative frequency with which aneurism occurs in the different portions of the aorta contained within the cavity of the chest, a careful analysis of Dr. Crisp's table, containing five hundred and fifty-one cases of spontaneous aneurism, yields the following results: The aorta above the diaphragm, that is, the portion of said vessel embraced between its origin at the left ventricle of the heart and the point where it passes through the aortic opening of the diaphragm, was the seat of aneurism in one hundred and seventy-five cases. Of them the disease was located in the ascending portion of the aorta in ninety-five instances; in the "aortic

arch" (by which term, I suppose, what is properly called the transverse part of the arch is meant) in forty-seven instances; and in the "descending thoracic" in thirty-three instances. From this, it appears that aneurism occurs about twice as often in the ascending as it does in the transverse portion of the aortic arch, and about three times more frequently in the ascending portion of the aorta than it does in all the "descending thoracic." By this term "descending thoracic" I suppose the descending portion of the aortic arch is embraced as well as the thoracic aorta, properly so called. In an appendix, dated 1851, Dr. Crisp gives sixty-seven additional cases of thoracic aneurism. Of these, thirty-six involved the ascending aorta (including six cases wherein the arch was also implicated), twenty-one were developed from the transverse portion of the aortic arch, and ten from the "descending thoracic." Adding these cases to the foregoing gives a total of two hundred and forty-two cases of aneurism developed from the aorta, within the cavity of the thorax, and distributed as follows: In one hundred and thirty-one instances the aneurismal tumour occurred in the ascending aorta; in sixty eight, in the transverse portion of the aortic arch; and in forty-three, in the descending thoracic. There appear to be serious typographical errors in some of the statements which Dr. Crisp has made concerning the general statistics of thoracic aneurism. (*Op. cit.*, p. 389.) Thus 175 (p. 127) + 67 (p. 388) = 242, instead of 241 cases in all of thoracic aneurism, as stated on page 389. Again, the quantities 134+69+31 (given also on p. 389), = 234, and not 241 or 242. We have, therefore, considered the figures in the paragraph on general statistics on page 389 as erroneous, and have made the necessary corrections of them. We have succeeded in doing this by analyzing, first, the general table containing 551 cases of spontaneous aneurism, and extracting therefrom the 175 cases of that disease involving the aorta above the diaphragm, then ascertaining in how many of them the disease was located in the ascending aorta, the transverse portion of the arch, and in the descending thoracic respectively, and adding thereto the details of the information on the subject of thoracic aneurism contained in the appendix. In this way we obtain a total of 242 cases of aneurism of the aorta occurring in the thorax and developed from the several anatomical divisions of that vessel above the diaphragm in substantially the same proportions as already pointed out, namely, about twice more frequently in the ascending aorta than in the transverse portion of the arch, and about three times oftener in said ascending aorta than in the whole of the descending thoracic.

But it should be borne in mind, while we are making these deductions from the statistics collected by Dr. Crisp, that all, or nearly all, of said cases of aortic aneurism occurred in either hospital or private practice, and that, if we were able to add to them the cases of this form of disease which occur in neither hospital nor private practice, cases which die suddenly while engaged in the ordinary avocations of life, without any professional

attendance whatever, or, at least, without any steady attendance, and without the real cause of death becoming known until perchance an autopsy is held, we should probably find that aneurism occurs in the ascending portion of the aortic arch with much greater relative frequency than is indicated by the study of Dr. Crisp's table, the general results of which have been given in the preceding paragraphs. The question which is here raised will, judging from the rapid progress now being made in pathological science, probably be definitely settled before the lapse of many years.

Again, a question of much importance, in a practical point of view, is that which concerns the development of aortic aneurism in its relation to population, and especially to numbers. How often does that disease occur in a given population? For reasons already stated we are not prepared to furnish a satisfactory answer to that question at the present time. We can, however, safely say that although this disease does not occur very often, it does in reality occur much more frequently than has generally been supposed, and that it is not by any means a rare affection. Upon this point the record of deaths, with the causes thereof, occurring in the city of New York for several years past, affords valuable information, notwithstanding the record is obviously incomplete. On examining the City Inspector's reports for a series of years, we find that during a period of nine years (from 1856 to 1864 inclusive), no less than two hundred and forty-three interments of subjects, whereof aneurism was recognized as the cause of death, were registered in his office. In how many additional instances, during this period, death was, in reality, produced by internal aneurism, although reported as occasioned by some other cause, such as "rupture of a bloodvessel," "hemorrhage," "disease of the heart," "angina pectoris," and "apoplexy," must be left to conjecture. But, at the same time, I am thoroughly convinced that the number of such instances is not small. However, the figures mentioned above yield an average of twenty-seven deaths per annum, for a period of nine years, in which aneurism was recognized as the cause of disease. The City Inspector's reports further show that of these two hundred and forty-three fatal cases of aneurism, one hundred and forty-eight were instances of aortic aneurism, eighteen of cardiac aneurism, and that in seventy-seven instances the artery involved in the disease is not stated. Now, when we reflect that external aneurisms do not, as a general thing, prove fatal, but are, for the most part, cured by surgical treatment, we are justified in considering that, at least, a very large majority of the seventy-seven instances in which the diseased artery is not named in the above-mentioned reports, were instances of internal aneurism, and when we reflect further how seldom any other form of internal aneurism occurs in comparison with that of the aorta, we are led to believe it probable that in a considerable majority of these seventy-seven cases the aneurismal disease was also located in the aorta.

The following table, which the writer has carefully compiled from the annual reports of the City Inspector, exhibits, at a glance, the number of deaths from aneurism, which were returned to that officer, during each year from 1856 to 1864 inclusive, together with an approximate statement of the varieties thereof, and the ages of the subjects.

Tabular Statement of the Deaths from Aneurism reported by the City Inspector of New York, during a period of Nine Years, ending with 1864.

		From											Total.		
		2 to 5 yrs.	5 to 10.	10 to 15.	15 to 20.	20 to 25.	25 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	80 to 90.		
1856.	Aneurism . . .	...	...	...	...	...	...	1	3	...	2	...	...	6	
	do of aorta	...	1	...	...	...	1	2	4	2	...	...	...	10	
	do of heart	...	...	...	...	...	1	1	...	...	...	1	...	3	
														—	19. 1856.
1857.	Aneurism . . .	...	...	...	...	...	2	2	2	...	...	1	...	7	
	do of aorta	...	...	...	...	...	2	6	3	1	...	1	...	13	
	do of heart	...	...	...	...	...	...	...	1	2	2	...	...	5	
														—	25. 1857.
1858.	Aneurism . . .	...	...	...	1	...	1	3	2	...	...	...	1	8	
	do of aorta	...	...	...	...	2	4	4	11	1	3	1	...	26	
	do of heart	...	...	...	...	1	1	1	...	...	1	...	...	4	
														—	38. 1858.
1859.	Aneurism . . .	...	...	1	...	...	...	4	1	2	...	...	...	8	
	do of aorta	...	...	...	...	...	...	6	6	...	1	...	...	13	
														—	21. 1859.
1860.	Aneurism . . .	1	...	...	...	...	2	5	...	2	3	...	1	14	
	do of aorta	...	...	...	...	1	3	2	4	...	...	...	...	10	
	do of heart	...	...	...	...	...	...	1	...	...	...	...	...	1	
														—	25. 1860.
1861.	Aneurism . . .	...	...	1	...	...	2	5	1	...	1	...	...	10	
	do of aorta	...	...	...	1	1	1	12	6	3	1	...	...	25	
														—	35. 1861.
1862.	Aneurism . . .	...	...	...	1	...	2	3	3	...	1	1	...	11	
	do of aorta	...	...	...	2	...	1	7	4	3	2	1	...	20	
	do of heart	...	...	...	...	...	...	...	...	1	1	...	...	2	
														—	33. 1862.
1863.	Aneurism . . .	...	...	...	...	...	1	1	3	2	...	...	...	7	
	do of aorta	...	...	...	...	...	...	6	8	2	...	...	...	16	
	do of heart	...	...	...	...	...	...	1	...	...	1	...	...	2	
														—	25. 1863.
1864.	Aneurism . . .	...	...	...	...	...	...	2	2	1	1	...	...	6	
	do of aorta	...	...	...	...	1	1	6	5	2	...	...	...	15	
	do of heart	...	...	...	1	...	...	...	...	...	...	...	...	1	
														—	22. 1864.
	Total . . .	1	1	2	6	6	25	81	69	24	20	6	2		243.

With regard to the age at which death occurs from aneurism, the analysis of the above table shows that during the period of nine years there died of aneurism in New York city 1 between the age of 2 and 5 years, 1 be-

tween 5 and 10, 2 between 10 and 15, 6 between 15 and 20, 6 between 20 and 25, 25 between 25 and 30, 81 between 30 and 40, 69 between 40 and 50, 24 between 50 and 60, 20 between 60 and 70, 6 between 70 and 80, 2 between 80 and 90. *Total* 243. From these statistics it appears that the decade embraced between the age of 30 and 40 is much more exposed to the occurrence of aneurism than any other period of life of the same duration, since 81, or exactly one-third of the whole number, died during that decade. Next to this, in respect to fatality from aneurism, stands the decade between 40 and 50, during which period 69 died, or rather more than one-fourth of the whole number. During the period of ten years, embraced between the age of 20 and 30, no less than 31, or about one-eighth of the whole number, are reported as destroyed by aneurism. Only about one-tenth of the deaths occurred between the age of 50 and 60, and one-twelfth between 60 and 70. Of the the whole number of deaths 219 occurred between the ages of 25 and 70, and it is a circumstance not without palpable meaning that of these 219 deaths 175, or more than three-fourths, happened between the ages of 25 and 50, a period which is well known to be the most active and laborious of any during life.

The yearly average of deaths from aneurism that are reported as such in New York is 27.

The largest number of deaths from aneurism reported in any one year was 38, and the smallest 19. The former occurred in 1858, and the latter in 1856. I cannot help thinking that the proportion of aneurism of the heart exhibited by the foregoing table is very large, being something over one-fourteenth of the whole number, and that cases of aneurism of the ascending aorta which have burst into the right auricle or ventricle, and perhaps other instances, may have been classified as aneurism of the heart.

With regard to sex, the City Inspector's reports show that of the 243 deaths from aneurism, 200 subjects, or something over four-fifths of the whole, were males, and but 43 females.

With regard to the nationality of those who died of aneurism, 81, or exactly one-third of the whole number, were natives of the United States; 161 were foreign born, and in one instance the nativity was unknown. From this it appears that emigrants are much more liable to become affected with this disease than our native population. Of the 81 deaths from aneurism occurring in persons born in the United States, 9 were subjects of African descent (coloured), which shows that the negro is not exempt from this disease.

Of the 10 cases which will be narrated in this essay, 1 was between 15 and 20 years of age, 1 between 20 and 25, 1 between 30 and 40, 6 between 40 and 50, and 1 between 50 and 60. The youngest was 16, and the oldest 50 +. All of them were males.

In respect to nativity, 4 of them appear to have been born in this

country and 6 in Europe. Of the latter, 5 were natives of Ireland, and 1 of Germany.

In respect to colour, 9 were white and one was a negro.

With regard to occupation, 3 of them were labourers, 1 a cartman, 1 a soldier, 1 a baker, 1 a confectionery-maker, 2 were merchants, and the remaining 1 was a mere lad without employment. It will thus be seen that most of them followed occupations that were laborious and often required considerable and occasionally great muscular exertion.

CASE I. *Aneurism developed in a branch of the pulmonary artery; sudden death from rupture of the sac and hemorrhage; autopsy; miliary tuberculosis, etc.*—Robert Frost, a young lad of 16, a native of Ireland, was admitted to Ward No. 2, N, of the Emigrants' State Hospital (care of Dr. Wendel), November 29, 1849. He stated that he had suffered from an attack of hæmoptysis three weeks previous to admission, and that his expectoration had been tinged with blood for the last two or three days. At time of admission he was pale and anæmic, but in good flesh. The bloody expectoration continued one day after admission and then ceased entirely. He seemed to be improving rapidly till December 12th. On the morning of that day he complained of having cough and a sense of tightness in his chest. However, these symptoms were not sufficiently prominent to attract much attention. His playfellows report that he and they had some liquor in the afternoon, but whether they drank any of it is not stated. About 6 o'clock P. M., of the same day, while getting into bed and being apparently as well as usual, he suddenly began to vomit blood. He vomited three times in all—a chamberful each time, the nurse stated. The first two vomits consisted of red blood, the last was dark. In three minutes after the vomiting began he was moribund.

Autopsy twenty-two hours after death.—Cadaver very pale and waxy. Suggillations very slight. Embonpoint preserved. Frothy sanguineous fluid oozing from mouth. Left lung contains but very little blood. It is extensively infiltrated with miliary tubercles. Its bronchial tubes contain a considerable quantity of frothy bloody fluid. Right lung strongly adherent to parietes of chest throughout. It is also extensively infiltrated with miliary tubercles. Its lower lobe is for the most part solidified by tubercular pneumonia. Its bronchial tubes are filled with frothy bloody fluid. Occupying the central and superior portion of the inferior lobe of the right lung there is a smooth and well-rounded cavity, larger (considerably) than a hen's egg, and filled with blood. A bronchial tube of considerable size opens into this cavity—other and smaller ones probably do also. The walls of the cavity are smooth, firm, and composed of cellular tissue condensed by pressure. Some blood is infiltrated into the pulmonary tissue lying around or adjoining the walls of the cavity. Situated on one side and just within this cavity *there is a small aneurism developed from a branch of the pulmonary artery.* This vessel, where it enters the aneurism, is between two and three lines in diameter. The aneurism, where most dilated, is nearly six lines in width. Its sac has been ruptured and the blood has escaped into the pulmonary cavity described above. Said cavity contained a coagulum larger than a hickory-nut.

The *stomach* contains between a pint and a quart of liquid, which consists of blood blackened by the action of the gastric juice, and mixed with food in process of digestion. The duodenum also contains a small quantity of a similar liquid.

I witnessed the autopsy and entered substantially this account of the case in my note-book at the time. Dr. Tellkampf, who was then Physician-in-Chief of the hospital, also attended the autopsy.

Comments.—This subject died of hemorrhage. The unwonted pallor and the waxy appearance of the cadaver, together with the absence or greatly diminished quantity of suggillation in the depending portions thereof, indicated a highly anæmic condition which had been produced by excessive loss of blood, and would have assured us, without opening the body, that death had been occasioned by hemorrhage, even if the clinical history of the patient had been less clear upon this point. On completing the autopsy it was found that the fatal outflow of blood had taken place, not only from the ruptured aneurism of the pulmonary artery, but also from the gastric mucous membrane. The patient had not only had *hæmoptysis*, but also *hæmatemesis*, and these two forms of hemorrhage combined destroyed his life in a few minutes. There was no solution of the continuity of the gastric mucous membrane visible to the unaided eye. Lacerations of a microscopic character were, however, in all probability, present, since the blood had been poured out (extravasated) with great rapidity, and in great quantity, from the mucous membrane of the stomach, as was proved by the fact that very copious vomiting of blood occurred during life, and after death the stomach was found to be filled with that liquid. With regard to the cause of this hemorrhage from the gastric mucous membrane we can only say that, with our present knowledge of the subject, we are unable to assign even a plausible one for its occurrence. Was it connected with the drinking of ardent spirits in the afternoon, or with leukæmic changes in the composition of the blood, or with stagnation of the blood in the gastric veins analogous to what occurs in those cases of parenchymatous hemorrhage (so-called), which are not unfrequently met with in surgical practice? These questions are deeply interesting to both the student of pathology and the practitioner of our art, but to none of them are we able to give a decided answer. Fatal hemorrhage from the gastric mucous membrane occurs so seldom as to afford but rare or infrequent opportunities for investigating this form of bleeding, and hence the stock of our positive knowledge on this subject is very limited.

With regard to the cavity in the right lung which was found in connection with the aneurism of the pulmonary artery, it is probable that it had been produced mainly by the rupture of the sac of the aneurism and the extravasation of blood therefrom into the pulmonary tissue, which had previously been condensed (more or less) by tubercular inflammation. The extravasated blood, through the impulse imparted to it by the contraction of the right ventricle of the heart, pushed gradually before it the pulmonary tissue, and thus the cavity continued to increase progressively in size until one or more of the air-passages was opened by ulceration (perhaps), and the blood was permitted to flow away through these new channels. It was

from this source that the bronchial tubes became filled with bloody fluid. It is worth while to remark, also, that in this case the lungs were extensively infiltrated with miliary tubercles, since it has been thought by some that the tubercular dyscrasia is incompatible with the development of aneurism.

So far as I know there are but two other cases of aneurism of the pulmonary artery on record. Both of them are referred to in Dr. Crisp's table (vide *op. cit.*, p. 245 and p. 257). One of them appears to have been attended by Dr. Peacock, and the other by Mr. Fearn. Both of them had hæmoptysis, and died in consequence thereof. In both of them the aneurism was developed, not from the trunk of the pulmonary artery, but from one of its branches. It will be recollected that, in the case just related, the aneurism was also developed from one of the branches of the pulmonary artery.

CASE II. *Aneurism of ascending aorta; sudden death from rupture of sac and extravasation of blood into pericardium; autopsy.*—John Descher, æt. 45, a German, by occupation a confectionery-maker, was found, on the evening of March 14th, at 8 o'clock, lying dead on the floor of the basement in his house. It appears that he had complained of having pain in his chest and left shoulder for a considerable length of time, and that the pains got worse during the last two weeks of his life. He was supposed to be affected with chronic rheumatism, and the real nature of his disease was not suspected; at least, I was informed to that effect by the members of his family when I examined the body after death.

Autopsy twenty hours post-mortem.—Rigor mortis strong; expression of countenance that of heart disease. The pericardium contains about ten ounces of blood, the coagulated portion of which is rather more than six ounces in volume, and lies in front of the heart, covering it as a shield. This blood had escaped from an aneurism of the ascending aorta which had burst into the pericardial sac. The aneurism is pouch-shaped and communicates with the aorta by an opening or hole in the thickened internal and middle coats of that vessel, having a diameter of about three-fourths of an inch, and a margin well rounded off. The aneurism has been formed by the giving way of the internal and middle arterial tunics, or at least by a solution of their continuity, and by the progressive dilatation of the external coat. The interior of the aorta exhibits abundant atheromatous deposits throughout its ascending portion—less elsewhere. The heart is fatty, and its muscular tissue is soft and flabby. The mitral valve is somewhat thickened by deposit of atheromatous material in its laminæ; aortic valves natural. The inferior surface of the left lung was firmly glued to the diaphragm by old adhesions of an inflammatory origin. Both lungs contained more than the normal quantity of blood, thereby exhibiting passive congestion, but in other respects were sound.

Comments.—The immediate cause of death in this case was the arrest of the movements of the heart, which was effected by the pressure exerted upon that organ by the blood that was extravasated into the cavity of the pericardium from the ruptured aneurism. The aneurismal sac suddenly burst open, and blood from the aorta was then quickly forced through the

fissure in such quantity as to fill up the pericardial sac to distension, and to press upon the exterior of the heart from all sides to such extent as to render its diastole impossible. Thus, all the movements of the heart were suddenly and completely arrested. The great central organ of the circulation was literally drowned in its own blood.

Now, it is not necessary that any large or even very considerable quantity of blood should be thrown into the pericardial sac, more especially if the extravasation occurs suddenly, in order to secure a complete cessation of the heart's movements, and the immediate death of the subject. The extravasation of from eight to sixteen ounces of that liquid into the heart-case will generally accomplish such a result without delay. By referring to the report of the autopsy of this case we find that a sudden effusion of but ten ounces of blood into the cavity of the pericardium sufficed to compress the heart, and cause immediate death. There was an internal hemorrhage, but the quantity of blood effused was less than that usually abstracted by an ordinary venesection. The subject did not die from absolute loss of blood, but because the hemorrhage occurred in such a locality as to compress and paralyze one of the organs whose activity is essential to the continuance of life. Hence, it happened that in this case the cadaver did not present the blanched, waxy, and exsanguined appearance which is generally present when death has been produced by hemorrhage. Hence it was that the countenance of the dead in this case wore the expression of heart disease. Hence it came to pass that no one, not even an expert, who should perchance have founded his opinion with regard to the cause of death upon the external appearance of the body alone, would have believed that a fatal hemorrhage had occurred within the thorax, and that an important aneurism had been ruptured. If I had not held an autopsy in this case, I should certainly have supposed that death had been occasioned by disease of the heart; and the subjects belonging to this class generally have their sudden deaths attributed to heart disease, unless, perchance, a *post-mortem* examination is made, and in that way the real cause of death is ascertained.

The aneurismal tumour in this case was small in size, distinctly pouch-shaped, and communicated with the interior of the artery by a comparatively narrow orifice. The aneurismal sac was formed by a dilatation, not of all of the arterial tunics, but of the external coat alone, and hence it belonged to the variety called false. The internal and middle coats of the artery had given way before the outward pressure of the blood, and sustained a solution of their continuity thereby. Thus, the external coat was made to bulge at first, and afterwards the dilatation continued to increase through the impulse which was communicated without cessation to the blood contained within the sinus formed by the dilatation of said external coat of the aorta ascendens, by the contractions of the left ventricle of the heart. Thus, the aneurismal tumour continued to get larger, and the

walls of the sac to grow thinner, until finally they gave way, and a torrent of blood was poured into the pericardial sac, which immediately destroyed the victim's life in a way that has already been pointed out, and discussed at sufficient length. The internal and middle coats of the vessel gave way in the first instance, either because they were very much weakened by the process of *atheromasia*, or because they were perforated by an *atheromatous ulcer*, or from the operation of both varieties of the atheromatous process combined. At the autopsy it was found that the interior of the aorta exhibited abundant deposits of atheroma throughout the ascending portion of the arch; less elsewhere.

The fatty condition of the heart and the soft and flabby condition of its muscular tissue assisted in prolonging the victim's life in this instance. They diminished the force of the heart's contraction, and thus weakened the impulse of the blood within the aneurismal sac, and postponed the day of rupture.

The development of the aneurism in this case was attended with the production of certain subjective phenomena in the shape of pains in the chest and left shoulder which got worse as the hour for the sac to burst drew near. These pains were supposed to be rheumatic in character until the cause of death was ascertained by making an autopsy. It is possible that if these and other symptoms had been rigidly scrutinized during life, the existence of a thoracic aneurism would, at least, have been suspected.

CASE III. *Aneurism of ascending aorta; sudden death from rupture of sac, and extravasation of blood into pericardium; autopsy.*—Nov. 1st. At the 19th Ward Station House I made a *post-mortem* examination of the body of a coloured man, named Cambridge Ritter, æt. 45, who had died very suddenly a few hours previously. The deceased was a hard-working and industrious man, of good habits. He had never complained of having any sickness or distress, so far as I could learn. He suddenly fell down while engaged in his usual avocations, and almost immediately expired.

Rigor mortis strong. Muscular system well developed. The left pleural cavity contains some bloody serum (*post-mortem* exudation). The pleura itself exhibits no abnormity. The lungs are congested (passively). The pericardium is distended with coagulated blood; it contains *ten* or *twelve* ounces. The heart is moderately hypertrophied. The mitral valve is considerably thickened. The aortic valves also are thickened. Just outside of these valves, that is, at the commencement of the aorta, there is a pouch-shaped aneurism of that vessel about the size of a lime. It is situated on the anterior and right side of the vessel. It has been formed by dilatation of all the arterial coats. It has been burst open. The rupture is about one-third of an inch long, and the blood has flowed through it into the pericardium. The interior of the ascending aorta exhibits patches of atheroma.

Comments.—The death of this man was produced in precisely the same way as we have already seen that death was produced in the preceding case. The sac of small aneurism, developed from the descending portion of the

aortic arch, became ruptured, a quantity of blood was suddenly poured into the cavity of the pericardium through the fissure, the pericardial bag was immediately filled to distension, the heart was compressed, and all its movements immediately arrested. About ten or twelve ounces of blood only were effused. This quantity sufficed to distend the heart-case and produce a fatal result almost instantaneously.

The aneurismal tumour was pouch-shaped, about the size of a lime, and projected from the front and right-hand side of the aorta. Its sac was formed by a dilatation of all the arterial tunics, or, in other words, all three of the arterial coats entered into the composition of the sac. The aneurism was therefore of the variety called true. The coats of the vessel had yielded to the impulse of the blood contained within it, because they had become much weakened by the process of *atheromasia*, and at the autopsy numerous patches of atheroma were found in the ascending aorta.

The heart was larger and its muscular tissue more abundant than natural. It therefore contracted with greater power, and communicated a more vigorous impulse to the blood in the arterial system, than natural. Thus the hypertrophy of the heart tended materially to shorten this man's life by hastening the time for rupture of the sac to take place.

It is worthy of remark in this place that aneurisms belonging to the ascending portion of the aortic arch are developed most frequently from the front and right side, *i. e.*, the right anterior side, of the vessel, a circumstance which is probably due to the fact that the current of blood from the left ventricle of the heart sets more strongly against that side or part of the ascending aorta than it does against the other sides of that portion of the vessel.

CASE IV. *Aneurism of ascending aorta; sudden death; autopsy; pericardium full of blood; rupture of aneurismal sac; hypertrophy and valvular disease of heart.*—Sunday, October 17, at 4 o'clock P. M., I made a *post-mortem* examination of the body of a man named Lawrence Malone, æt. 45, born in Ireland, who had died suddenly, between ten and eleven hours before, at his dwelling in 39th Street, near Sixth Avenue. It appears, from the statement of his wife, that the deceased rose about 5 o'clock on that morning to minister to the wants of a sick child. In a little while he went to bed again. Soon afterwards his wife heard him moaning, and, on going to him, found him bathed in cold perspiration, and quite dead. He had been in bad health for several years, complaining of cough with slight expectoration, shortness of breath, and palpitation of the heart. Occasionally he spat blood. He drank to excess. He appeared to be as well as usual on the day before his death.

Body rather thin and pale; lips pale; rigor mortis well marked; pupils symmetrically dilated (somewhat). On opening the pericardium it was found to be distended with fluid and coagulated blood. The heart was very large and fatty (1st variety). The mitral valve was considerably thickened by an interstitial deposit of a semi-cartilaginous character. The aortic valves were much thickened, exhibiting rounded edges and a puckered appearance. They did not close up the aortic orifice completely, and there-

fore permitted regurgitation into the left ventricle of the heart. The lining membrane of the aorta ascendens was thickened and roughened by atheromatous deposits. About one inch above the aortic valves there was an aneurism or pouch-like dilatation of the wall of the artery, developed on the anterior side of the vessel, and having the size of an English walnut. The sac was very thin in many places. The rent was about one-fourth of an inch long, and its direction was longitudinal, that is, parallel with the long axis of the artery. The extravasation of blood of course took place into the pericardium. I did not discover any evidence, on examining the aneurism, that the internal or middle arterial tunics had been ruptured or perforated by ulceration at any time in the history of the affection. The aneurismal swelling appeared to have been produced by a progressive dilatation of all the arterial tunics. The middle coat may have disappeared from the spots where the aneurismal sac was very thin, but the internal coat was still present.

The *lungs* exhibited passive congestion, but in other respects were sound.

The *liver* was enlarged and fatty.

Comments.—This man had valvular disease of the heart, namely, insufficiency on the part of those placed at the aortic orifice, together with dilatation and hypertrophy of the left ventricle. The symptoms which were present during life, at least such of them as were described to me, appear to have been produced for the most part by the cardiac disease. They were shortness of breath, palpitation of the heart, dry cough, and occasional attacks of slight hæmoptysis. They denote that the action of the lungs were subject to passive congestions, and that the action of the heart itself was embarrassed.

The aneurism was pouch-shaped or sacculated, small in size, of the variety called true, since all the arterial tunics entered into the formation of the sac, and developed from the front of the aorta a short distance above its origin.

CASE V. *Sudden death from rupture of an aneurism of ascending aorta and extravasation of blood into pericardium: autopsy; old pleuritic and pericardial adhesions; hypertrophy and dilatation of heart; dilatation of aortic orifice; multiple aneurism; one involving ascending aorta, another located at commencement of descending aorta, and still another in lower part of thoracic aorta.*—Edward Lally, æt. about 45, a native of Ireland, a long-shore man by occupation, and said to be of rather dissipated habits, was engaged, on the afternoon of December 21st, hoisting cotton, when he suddenly fell down and died immediately and almost with the hoisting-rope in his hand. His body was removed to the 5th Ward Station House, where I made an *autopsy* about twenty-four hours after death.

Cadaver large and muscular. Rigor mortis strong. Face exhibited a dusky tinge as it often does in death by asphyxia. The *lungs* were extensively fastened to the thoracic walls by old and very strong pleuritic adhesions. These organs contained more than the normal quantity of pigmentum nigrum and were congested with venous blood. The *pericardium* was more or less adherent to the heart throughout its whole extent by strong white filaments and old fibrous bands or ribbons, which were undergoing absorption—having become elongated or drawn out by the motion

of the heart and considerably thinned or diminished in size at their middle portion. Some of them were so much thinned at the centre as to be nearly ready to break in two. Lying in the meshes of this adventitious tissue, within the pericardial sac, was a considerable quantity of extravasated blood. The interstices of said adventitious tissue were completely filled with blood. The clots were thickest and most abundant on the surface of the auricles, particularly the right one. The *heart* was much hypertrophied and the cavity of the left ventricle much dilated. The aortic orifice also was much dilated. It measured, when closed, or compressed, flat-wise, between $3\frac{3}{4}$ and $3\frac{7}{8}$ inches (English) in width. This measurement indicates that the aortic orifice was between $7\frac{1}{2}$ and $7\frac{3}{4}$ inches in circumference. The aortic valves were thinner than natural, and two of them exhibited a number of little holes near their free margin. Owing to the great width of the aortic opening the semilunar valves could not close it completely or well enough to prevent considerable regurgitation. Perhaps the stretching of the valves consequent upon the progressive dilatation of the aortic orifice had assisted to make them thin and likewise to make the holes in them.

Commencing just above the aortic valves was an *aneurism* of the variety called *fusiform* and *true*, which involved almost the whole of the ascending aorta. It was very large and had the size of my fist or that of a healthy adult male heart. The bulging out of the arterial coats had not occurred symmetrically or equally on all sides of the vessel, for it was more marked or extensive on the right anterior side than elsewhere. Rupture of the sac had been produced near the place where the right branch of the pulmonary artery crossed the aneurism, and through this rent the blood in the pericardial sac already mentioned had been poured out. The aneurism appeared to be full of blood when I opened the thorax. There were no heart clots. The origin of the arteria innominata was dilated almost to the size of my finger (aneurismal dilatation). At the commencement of the descending aorta there was a *sacculated aneurism* located on one side of the artery of the size and shape of the half part of an ordinary apple, which was nearly ready to burst from thinning and softening of its walls (with dark and red discoloration). Towards the lower end of the thoracic aorta there was a spot where the internal and middle coats of the artery had given way or yielded to the impulse of the blood, and the external coat with a layer of condensed cellular tissue upon its exterior was beginning to bulge out, constituting, as I think, the commencement of a common form of the so-called spurious aneurism. The aorta was atheromatous through the whole of the space above mentioned; below the diaphragm I did not examine it from want of time.

The *liver* was large, congested with venous blood, and presented a "nutmeggy" appearance (somewhat) on section. The *spleen* exhibited, on cutting it open, a dark-brown, almost black colour, and a firm consistence. It was also twice or thrice as large as natural. The lesions of this organ had probably been occasioned by stagnation of the blood or chronic venous congestion. The *kidneys* were dark-coloured and congested with venous blood. All the abdominal veins were congested.

Comments.—This man followed a very laborious occupation to gain a livelihood, working 'long-shore, as it is called, and being often called on to use much muscular strength. Although I made careful inquiry, I could not learn what symptoms he complained of, if any, during life.

This case possesses much more than an ordinary degree of interest. In the first place the aortic aneurism was multiple. Instead of one there were, in reality, three distinct aneurismal swellings developed from the aorta above the diaphragm. One of them was located in the ascending portion of the aortic arch, another at the commencement of the descending aorta, and a third in the lower part of the thoracic aorta. The first-mentioned was fusiform in shape, the second sacculated, and the formation of the third had but just commenced, and therefore it was small in size. The last-named was all the more interesting because it distinctly exhibited to us one of the earliest steps in the formation of false spontaneous aneurism. The internal and middle coats of the vessel had become so much weakened by the process of atheromasia that they yielded or gave way to the impulse of the blood, and thus sustained a solution of their continuity the size of which was increased by the separation of the edges or gaping occasioned by contraction of the muscular fibres belonging to the middle coat that had not yet been destroyed by the process of fatty degeneration. Through the orifice which had thus been made in the internal and middle tunics the blood came into direct contact with the external coat and caused it to bulge outwards. Here we had presented to us the commencement of the formation of the sac in a case of the so-called spurious aneurism. The connective tissue lying on the outside of the bulging portion of the external coat was beginning to multiply itself and likewise to coalesce with said coat. If this man's life had been prolonged for a sufficient length of time, the tumefaction would have continued to expand before the ceaseless pressure and impulse of the blood, until finally a pouch-shaped or sacculated aneurism of the thoracic aorta would have been produced.

In the second place the alterations in the structure of the heart were very strongly marked. The aortic orifice was very much dilated, and had become so large as to be about 2½ inches in diameter. The semilunar valves could not close it completely during the diastole of the heart, and consequently the blood regurgitated from the aorta into the left ventricle after each systole of that organ. We were, therefore, not surprised to find that the cavity of the left ventricle was much dilated, that its walls were much hypertrophied, and that the organ, as a whole, was much increased in size. The heart was also fastened to the pericardium by a great number of strong, old, white, elongated, fibrous threads, cords, and bands, which were the final products of an inflammation of the pericardium that had occurred many years previously. It is possible that this man had been affected with acute rheumatism in childhood or in early youth, and that the pericarditis had been induced at that time by the rheumatic diathesis, a circumstance which it is well known is apt to happen to those who have acute rheumatism during the early periods of life. If such were really the case then the rheumatism, with its cardiac complication, laid the founda-

tion for all the changes in the structure of the heart which subsequently occurred.

Again, while the blood which escaped from the ruptured aneurism in this case was extravasated into the pericardium as we have already seen that it was in the last four cases, a much smaller quantity of sanguineous effusion sufficed to arrest the movements of the heart in this case than in either of the others, because the pericardium happened to be extensively and firmly fastened to that organ by old adhesions. The blood which was poured out from the ruptured aneurism into the pericardial cavity flowed into the meshes and interstices of the network formed by the adhesions, and but a few ounces were required to fill them sufficiently to paralyze the heart. It is worthy of remark that the sanguineous effusion was most abundant on the surface of the auricles, the consequence of which was that the flow of blood from the system at large into the right side of the heart, and from the lungs into the left side of that organ was more or less impeded. Hence the countenance of the cadaver presented the livid hue, and the lungs the congested appearance, which are usually present in death from asphyxia.

CASE VI. *Large-sized aneurism of ascending aorta; rupture of sac and extravasation of blood into pericardium; instant death; autopsy; disease not suspected till after death.*—Mr. S—— C——, born in the United States, æt. 40, a merchant, of exemplary habits, had been troubled for several years with pains about the chest, shoulders, and arms, which were supposed to be of a rheumatic origin, together with cough. Latterly he had been suffering more severely, and had got a sense of oppression in his chest, which he located beneath the upper part of the sternum. On Thursday evening, July 16th, he was walking up Broadway, going home, and when in front of the Irving Rooms was attacked with faintness. He went into the rooms to rest himself, and to get a stimulant. Shortly after sitting down he instantly expired. His family were very anxious to be informed with regard to the cause of death.

Autopsy, July 18th.—Surface of body and lips pale. Lungs congested (passively). Pericardium filled with fluid and coagulated blood—coagulum equals about four ounces in volume. There is an aneurism of the ascending aorta, the sac of which is nearly as large as my fist. It had broken into the pericardium. The rent is about three-fourths of an inch long and has jagged edges. Heart fatty and well contracted. Aorta atheromatous. Cadaveric rigidity strong. Body had been preserved in ice.

Comments.—The aneurismal sac attained a considerably greater size in this case than in any of those that as yet have been related except the last; among the consequences of which was, that the functions of the neighbouring parts and organs were disturbed more or less considerably by the pressure it occasioned, and that symptoms of a more troublesome and distressing character were produced than we have seen in any previous case. The aneurismal tumour, which, as already stated, was developed from the ascending portion of the aortic arch, was almost as large as my fist, and the symptoms which it produced were mainly due to the encroachment which it made upon

the domain of the surrounding organs. The symptoms, which were narrated to me by the family of the deceased, were all of a subjective character, with the single exception of cough. He complained of pains in the chest, shoulders, and arms, that were supposed to be of a rheumatic character, which, as the aneurism grew larger, became more severe. The cough also appears to have become more troublesome as the disease advanced. Finally he got an ill-defined sense of oppression and distress which appeared to him to be located immediately behind the upper part of the sternum, where the aneurismal tumour was found on making the autopsy. Of course I am not informed with regard to what physical signs were discovered on examining his chest during life. The post-mortem examination, however, showed that dulness on percussion ought to have been detected over the site of the tumour, together with the aneurismal bruit; and the writer now begs leave to ask, whether it is not probable that if this gentleman's case had been thoroughly investigated, and a comprehensive view of it taken, the symptoms both subjective and objective being submitted to a rigid interpretation, both individually and collectively, and the method of exclusion employed as far as practicable, a diagnosis of aortic aneurism would have been made with reasonable certainty? It is, however, undoubtedly true that the professional advisers of this gentleman would have been much more likely to have made a correct diagnosis if they had born in mind the fact that aneurism of the thoracic aorta occurs pretty frequently, instead of leaving it entirely out of their calculation while examining the patient from time to time.

CASE VII. *Aneurism of ascending aorta; sudden death; autopsy; extravasation of blood into pericardium from ruptured aneurismal sac.* —John Duck, a cartman, æt. about 40, and born in Ireland, while pursuing his occupation met with an accident which made it necessary for him to overtax his strength in lifting. This occurred on Thursday afternoon, September 2d. He began directly to complain of pain and distress in his chest. His friends thought him to be suffering from a strain. On the following day he went out with his cart to do some light work. About one o'clock P. M., while his horse was feeding, he went into a grocery store. After he had been there a few minutes he suddenly fell down on the floor, and immediately expired. He did not utter a complaint, nor even an exclamation.

Autopsy, Saturday, September 4th, twenty-two hours after death.—Body fresh and looking quite natural. Rigor mortis very strong. The pericardium is distended with fluid and coagulated blood. The clot fully equals eight ounces in volume. This blood has been poured out from an aneurism of the ascending aorta by rupture of the sac. The fissure is one-third of an inch long. The lungs exhibited passive congestion. There were no pleuritic adhesions, except at the apex of the left lung, where some old tuberculous deposits were found, the effects of which had been thoroughly repaired, and the tuberculous matter itself had undergone the calcareous transformation. Dr. Budd took the aneurismal specimen.

This case does not seem to require any extended comment, since its general features are similar to most of those that we have hitherto related. We would only remark that the suddenness with which death was produced was very striking. This man fell down upon the floor and died without uttering a complaint or even an exclamation.

CASE VIII. *Aneurism of ascending aorta; sudden death from rupture of the sac and extravasation of blood into the parenchyma of the right lung, and into the right pleural cavity; autopsy; old pericardial and pleuritic adhesions.*—William Cook, æt. 35, born in Kentucky, a commission merchant, had complained for fully four years of pain in his breast, and notwithstanding the use of many remedies to obtain relief it had grown progressively worse. On Tuesday night, December 28th, he coughed a good deal, and spat some blood. On Wednesday night, December 29th, he coughed violently, spat a considerable quantity of blood, and died suddenly in a paroxysm of coughing. The existence of aneurism was not suspected. I gather the above-mentioned information concerning him from his relatives and friends, post-mortem.

Autopsy, December 30th, about ten hours after death.—Surface of body, pale. Rigor mortis strong. On dividing the cartilages of the right side of the chest a yellowish serum began to flow out of the right thoracic cavity, and, on turning up the sternum, that cavity was found to contain a large quantity of blood (mostly coagulated with some yellowish serum floating above it), whereby the right lung was compressed and the mediastinum pushed over towards the left side. We removed from the right pleural cavity over one gallon of fluid and coagulated blood, and then found the right lung to be firmly adherent to the walls of the chest throughout its superior portion, and to contain a considerable number of old tuberculous concretions in its parenchyma in the same locality. The anterior margin of the superior lobe was adherent to a large pouch-shaped aneurism of the ascending aorta, and the pulmonary tissue was here infiltrated with blood, which had been extravasated from the aneurism. The left lung contained less than the usual quantity of blood, but in other respects was natural. There were scattered filamentous and band-like adhesions of an old date in the pericardial sac, connecting together its visceral and parietal surfaces. They appeared to be undergoing absorption. The ventricles of the heart were firmly contracted. The organ was moderately hypertrophied. The aneurism was large, pouch-shaped, and projected from the ascending aorta in a direction upwards and towards the right side. It had burst at the part where the right lung adhered to it. Hence the blood was extravasated, first into the pulmonary tissue; afterwards the rent became larger and the blood was poured out in great quantity into the right pleural cavity. The ascending aorta was atheromatous. The liver and spleen were enlarged, apparently from stagnation of blood or chronic venous congestion.

Comments.—This man died of internal hemorrhage. The sac of a large aneurism, developed from the ascending aorta, burst into the cavity of the right pleura, and so great a quantity of blood was effused into that cavity as to quickly destroy his life. Hence the surface of the corpse presented a pale, waxen, and exsanguinated appearance, which afforded a marked contrast to the external appearances that were observed in the last

six cases, wherein the aneurism pursued a different course, and burst into the pericardial cavity, and drowned the heart with blood, as has already been pointed out.

Now, aneurisms developed from the aorta within the thorax terminate in death by bursting into a considerable number of cavities and organs besides the pleura and the pericardium, which are mentioned above. Perhaps the most comprehensive view which we can obtain of the different methods in which aortic aneurism within the thorax terminates in death, is afforded by a critical examination of Dr. Crisp's table of five hundred and fifty-one cases of spontaneous aneurism, to which reference has already been repeatedly made. Such a reference to that table shows that thoracic aneurism of the aorta very often proves fatal by bursting into the cavity of the pericardium,[1] and not unfrequently by breaking externally. It also shows that in nine instances an aortic aneurism within the chest burst into the *œsophagus*, in five instances into the *trachea*, in five cases into a *bronchus*, either left or right, in five cases into the *pulmonary artery*, in three cases into the *right auricle of the heart*, in two cases into the *right ventricle*, in two cases into the *left ventricle*, in four cases into the *superior vena cava*, in eighteen cases into one or other of the *pleural cavities*, in three cases into the *mediastinum*, and in five cases into the *tissue of the lungs*. From this it appears that aneurisms developed from the portion of the aorta contained within the thorax generally prove fatal, by bursting either into the cavity of the pericardium, or that of the pleura, or externally, but that in exceptional instances death is produced by effusion of blood into the various organs above mentioned.

A critical examination of Dr. Crisp's table shows further, that no less than twelve cases of thoracic aneurism proved fatal, not from rupture of the sac, but from *pressure* made by the aneurismal tumour upon the *trachea*, inducing thereby *dyspnœa*, *orthopnœa*, *croupal symptoms*, *exhaustion*, and death. This point will be more attentively considered when we come to the special discussion of the symptomatology and the diagnosis of aortic aneurism.

CASE IX. *Sacculated aneurism of thoracic aorta; sudden death from rupture thereof; autopsy.*—David Hogue, æt. 50, by occupation a baker, died suddenly and unexpectedly about 4 o'clock P. M., on Saturday, April 17th. I was informed that he had complained of pain in the back, which he referred to his kidneys, for some time previous to death, and that his habits were intemperate.

Autopsy nineteen hours after death.—Rigor mortis very strong. Surface of body, lips, gums, etc., very pale. Cartilages of ribs ossified. *Right* pleural cavity contains about one gallon of fluid and coagulated blood—coagulum small. Inferior lobe of right lung much compressed, flattened

[1] In ninety-eight cases of aneurismal disease involving the ascending aorta, the tumour burst into the pericardium in thirty instances, and opened externally six times. *Vide* Dr. Crisp, *op. cit.*, p. 134.

in shape, and about two inches thick. *Left* pleural cavity contains about one pint of blood. On posterior surface of left lung, directly beneath the pleura pulmonalis, there are several small flat-shaped clots of extravasated blood, which raise that membrane above the surrounding surface. The parenchyma of this lung, on section, exhibits several spots in which blood has been effused into its texture (pulmonary apoplexy). Both lungs contain an abnormally abundant quantity of pigmentum nigrum. The posterior mediastinum is extensively invaded with extravasated blood. There is also some extravasated blood in the diaphragm which lies directly underneath both its pleural and peritoneal investment. The peritoneal cavity (abdomen) contains about one gallon of fluid and coagulated blood. There are clots of considerable size in each hypochondrium. The source of all this hemorrhage was a ruptured aneurism of the thoracic aorta situated just above the diaphragm. *Heart* enlarged and fatty. This organ also exhibits on its exterior two milk-spots of an inflammatory origin, one large in size and situated over the right ventricle, the other smaller and situated over the left ventricle near the apex. The muscular structure of the heart is softer than natural, and the muscular tissue throughout the body is in the same condition. The mitral valve is somewhat thickened. There are no heart clots. The lining membrane of the aorta exhibits abundant deposits of atheroma, by which it is thickened and roughened. Its color is pale lemon yellow. *Liver* very large, empty of blood, and presenting a "nutmeggy" appearance on section. *Spleen* smaller than natural, presenting externally a shrivelled appearance and a dirty purplish white colour. It also exhibits on its peritoneal surface irregularly shaped grayish white firm granules, formed from old plastic exudation, in large number. Texture of spleen very soft and pale red in colour. The *kidneys* present an exsanguinated appearance (pale colour), but in other respects are natural.

Comments.—This man also died from loss of blood in the way of an internal hemorrhage, which proceeded from a ruptured aneurism of the thoracic aorta. The case is a remarkable one, especially on account of the large quantity of blood which was extravasated, and the wide space through which the extravasation was diffused. It was met with in both pleural cavities, in the mediastinum, beneath the pleura pulmonalis and in the pulmonary tissue, beneath both the pleural and peritoneal investments or coverings of the diaphragm, and in the cavity of the abdomen. In quantity it was enormous, and was estimated as exceeding two gallons.

The growth of the aneurism in this case was not unattended with the development of morbid phenomena, for he complained of having a good deal of pain in his back, which he ascribed not to the real cause, but to an affection of his kidneys. It will not be forgotten that the aneurismal tumour was located near the lower end of the thoracic aorta, where that vessel is placed in relation with the bodies of the inferior dorsal vertebræ.

The heart was also diseased. It was enlarged, flabby, soft, and fatty. Besides, there were two milk-spots on its exterior, which had their origin, a long time previously, in an inflammation of the pericardium. The reader has doubtless observed that the heart was diseased in nearly all the cases that have been narrated in this essay. In seven of them it exhibited

changes in structure to greater or less extent, in two of them its condition is not stated, and in one instance, not yet related, it appears to have been nearly normal. In three cases there were distinct evidences of old pericarditis. In five cases there was more or less thickening of either the mitral or aortic valves, or both of them. In two cases the aortic valves were insufficient and permitted the blood to regurgitate into the left ventricle. In five cases it is stated that the heart was hypertrophied, and in two additional cases the muscular structure of the organ was undergoing fatty degeneration. From these facts, we infer that the same causes which induce the development of aortic aneurism are exceedingly apt to induce changes in the structure of the heart also.

This man was intemperate. It is likewise worthy of remark in this connection, that, of our ten cases, seven are known to have used alcoholic drinks to excess either habitually or occasionally, while three of them were reported to have been hard drinkers.

CASE X. *Sudden death of a soldier occasioned by the rupture of a spontaneous aneurism of the abdominal aorta; a large quantity of blood extravasated into the cavity of the peritoneum; autopsy.*—Camp Observation, Maryland, Tuesday, October 15, 1861. A young soldier, an Irishman, aged 22, died suddenly last evening at the camp of the Sixty-ninth Pennsylvania Volunteers. He was a good soldier, and had never been excused from duty. On Sunday he was on picket. On Monday he was at battalion drill in the afternoon and at dress parade in the evening, after which he ate a hearty supper. He had not complained of any sickness except occasionally of pains in the epigastrium; but he had never been put upon the sick report. About eight o'clock last evening he was standing near the door of his tent, joking with a comrade, when, without warning, he fell to the ground and almost immediately expired. A few minutes afterwards I saw the body. The lips, gums, and surface of the body generally were very pale and blanched, so much so that I did not hestitate to express the opinion that death had been occasioned by internal hemorrhage. Pupils (both) dilated symmetrically. It was stated that he had sometimes indulged in excessive drink.

Autopsy thirteen hours after death.—Rigor mortis strong; muscular system well developed; cavity of abdomen filled with fluid and coagulated blood; I removed from that cavity more than six quarts which had flowed out from a ruptured aneurism of the abdominal aorta; the aneurism was developed from the front of the aorta just below the origin of the cœliac axis, and protruded forwards between the crura of the diaphragm; it obtained the size of a Sicilian orange, and its anterior wall was quite thin; the fatal rent in it was rather more than one inch in length; there were atheromatous deposits in its walls; neither stomach nor intestines were adherent to it.

The digestive tube was healthy. The liver was pale (anæmic), and exhibited some thickening of Glisson's capsule in spots. The spleen was fastened to the diaphragm by old adhesions. Its capsule was also thickened and presented a pearly colour. Its parenchyma was firmer than natural. The kidneys were pale (anæmic), and contained more than the usual quantity of fat in their pelves.

The heart was natural in size, firmly contracted and empty of blood. It exhibited somewhat more fat than normal on its exterior. In the ascending aorta spots of atheroma were found.

Comments.—This case of aneurism affecting the abdominal aorta proved fatal from rupture of the sac and extravasation of blood into the peritoneal cavity. Indeed, aneurismal tumours involving that vessel below the diaphragm often terminate by bursting into the peritoneal sac. But the rupture of the sac and the effusion of blood consequent thereon do not always occur in that direction. Aneurisms of the abdominal aorta not unfrequently burst into some portion of the intestinal canal to which they have contracted adhesions. The duodenum from its anatomical relations with the aorta is especially liable to become affected in that way, but I have also known the rupture of the sac to occur into the transverse colon. Abdominal aneurisms also burst oftentimes behind the peritoneum. Furthermore, they sometimes break into the ascending vena cava, into the left pleural cavity, into the pulmonary tissue, and into the mediastinum.

Aneurisms of the abdominal aorta occur much less frequently than aneurisms of the thoracic aorta, a circumstance which has already been pointed out, together with the reasons therefor.

Aneurisms of the abdominal aorta can be diagnosticated much more readily than aneurisms of the thoracic aorta, since the aneurismal tumour can, for the most part, be felt through the abdominal walls without much difficulty, and the pulsation together with the aneurismal thrill duly appreciated by the touch. I do not doubt that in the case just related a diagnosis would have been made during life, provided the subject had been subjected to a thorough physical examination. However, he was never subjected to such an examination, since the subjective symptoms produced by the disease did not at any time prove troublesome. The only symptoms of which he ever complained that were referable to the aneurism, consisted of occasional pains in the epigastrium. It should be remembered that the aneurism was located just below the cardiac axis, that it protruded from the front of the aorta, that its size was small, and that it did not encroach upon any important nerves or other organs. Hence it happened that the disease did not occasion any considerable amount of distress.

Symptoms and Diagnosis of Aortic Aneurism.—The following considerations, which are founded upon the topographical relations that exist between aneurismal tumours connected with the various parts of the aorta, and the neighbouring organs, will enable us to comprehend the symptomatology of this disease more completely, and to interpret its phenomena, especially those which are subjective in character, more correctly than we otherwise would be likely to do.

The ascending portion of the aortic arch is contained in the pericardium, and hence the aneurisms of that part of the vessel are very apt to burst nt o the pericardial cavity. It is situated just behind the sternum. It is

crossed at its commencement by the pulmonary artery, and the appendix of the right auricle, and has the root of the right lung behind, the vena cava descendens on the right side, and the pulmonary artery together with the left auricle on the left side. Aneurismal tumours of the ascending aorta may therefore compress either the superior cava, or the right auricle, or the adjoining part of the right ventricle, or the pulmonary artery, or the left auricle, and may, too, ultimately burst into any of these organs or parts of organs. In the majority of cases, however, they open into the pericardial sac. They may compress the superior cava to such extent as to seriously impede the flow of venous blood from the upper part of the body, and occasion thereby stagnation of the blood in that part of the system with all the consequences legitimately pertaining thereto. They may, in extreme cases, effect even a complete closure of that vessel by lateral pressure.

Aneurism of the ascending aorta, developed in the situation of the aortic sinuses, in the great majority of cases proceeds from the right coronary sinus. This circumstance appears to be mainly due to the fact that the regurgitation of blood upon the sinuses occurs chiefly on the right anterior aspect of the vessel. (Vide *Gray's Anatomy*, p. 364.) Aneurism of the ascending aorta, originating above the sinuses, implicates most frequently the right anterior wall of the vessel; this is probably owing mainly to the impulsion of the blood against this part by the contractions of the left ventricle, as has already been stated. The direction of the aneurismal tumour is also chiefly towards the right of the median line. If it attains a large size and projects forwards, it may cause absorption of the sternum and the cartilages of the ribs, usually on the right side, and appear as a pulsating tumour on the front of the chest, just below the manubrium, which may burst externally, or into the pericardium, or may compress and disturb the functions of the right lung, the trachea, bronchi, or œsophagus, and may even break into either of those organs (*op. cit.*, p. 365). Pressure exerted in this way upon the pulmonary tissue generally occasions dry cough. When it is exerted upon the trachea or bronchi, it usually produces cough and dyspnœa of an asthmatic character, by irritating the bronchial nerves and thus inducing spasm of the bronchial muscles. When it is exerted upon the œsophagus it generally occasions dysphagia.

With regard to the anatomical relations of the *transverse portion of the aortic arch*, the reader is reminded that the vessel here lies upon the trachea, the œsophagus, and the thoracic duct; that the left phrenic and pneumogastric nerves pass down in front of it; that the left recurrent laryngeal nerve, which, with its fellow of the opposite side, is the chief motor nerve of the laryngeal muscles, winds round it; and that from its convexity three large arterial trunks are given off, which supply the head, neck, and upper extremities with blood. Now, an aneurismal tumour developed from the posterior side or right aspect of the vessel, its usual site

when the transverse part of the arch is affected with this disease, may press upon the trachea, and impede the breathing, or produce cough, hæmoptysis, or stridulous respiration, or it may ultimately burst into that tube, producing fatal hemorrhage. Again, its pressure upon the laryngeal nerves may produce spasm of the laryngeal muscles, and give rise to symptoms which so closely resemble those of laryngitis, that the operation of tracheotomy has in some cases been resorted to from the supposition that disease existed in the larynx; or, it may press upon the thoracic duct, and destroy life by inanition; or, it may involve the œsophagus, producing dysphagia; or, it may burst into that tube, and then fatal hemorrhage will occur. Again, the innominate artery, or the left carotid, or the left subclavian, may become so much obstructed with coagulated blood, in connection with an aneurism of the aortic arch, as to produce a weakness, or even a disappearance of the radial pulse on one or other side; or, the aneurismal tumour may present itself at or above the manubrium, generally either in the median line, or on the right side thereof (*op. cit.*, p. 365).

Aneurism affecting the descending thoracic aorta usually projects backwards and to the left side, causing absorption of the vertebræ and corresponding ribs; or, it may press upon the trachea, left bronchus, œsophagus, and the right and left lungs, generally the latter. When rupture of the sac occurs, it usually takes place into the left pleural cavity; less frequently into the left bronchus, the trachea, the œsophagus, the right pleura, or into the parenchyma of the lungs. *In this form of aneurism, pain is almost a constant and characteristic symptom, existing either in the back or chest, and usually radiating from the spine around the left side.* We have already seen that pain in the back was a prominent symptom produced by aneurism of the descending thoracic aorta in Case IX. This symptom depends mainly, for its causation, upon the aneurismal sac compressing the intercostal nerves against the bone (*op. cit.*, p. 365).

Aneurism of the abdominal aorta is developed in nearly equal proportions from the anterior and posterior sides of this vessel near the cœliac axis (*op. cit.*, p. 420).

When an aneurismal sac projects from the posterior side of the abdominal aorta, it usually causes absorption of the bodies of the vertebræ with which it comes in contact, and forms a pulsating tumour, that presents itself in the epigastric or left hypochondriac regions, accompanied by symptoms of disturbance of the digestive function and of the intestinal canal. *Pain is invariably present*, and is usually of two kinds: 1, a fixed and constant pain in the back, caused by the tumour pressing on or displacing the branches of the solar plexus and splanchnic nerves, and, 2d, a sharp lancinating pain, radiating along those branches of the lumbar nerves which are compressed by the tumour; hence the pain in the loins, the testes, the hypogastrium, and the lower extremity, especially or chiefly observed on the left side. This form of aneurism usually bursts either into the cavity

of the peritoneum, or behind that membrane in the left hypochondrium; or, it may expand into a large aneurismal sac, extending down as low as Poupart's ligament and the groin, in which situation it has sometimes been punctured on the supposition that it was an abscess (*op cit.*, p. 420).

When an aneurismal sac projects from the front of the abdominal aorta, near the cœliac axis, it also forms a pulsating tumour in the epigastric or left hypochondriac regions, and is usually attended with symptoms of disturbance of the alimentary canal, such, for example, as sickness, dyspepsia, and constipation, which result from compression of the solar plexus or the splanchnic nerves effected by the tumour. *It is likewise accompanied by pain, which is constant, and nearly always fixed in the epigastrium, loins, or some part of the abdomen;* the radiating pain being rare, since the lumbar nerves are seldom implicated. This form of aneurism may burst into the peritoneal cavity, or behind the peritoneum into the connective tissue which is embraced between the layers of the mesentery, or, more rarely, into the duodenum, or the transverse colon; it generally does not extend backwards so as to affect the spine (*op. cit.*, p. 420). In Case X., which, as the reader will remember, belongs to this category, the pain was located in the epigastrium, and was not severe, but the aneurismal tumour happened to be small in size.

In other cases of aneurism of the abdominal aorta the pain is very intense. I remember one instance that produced a very profound impression upon me at the time I witnessed it, which was many years ago. A middle-aged man had complained for a long time of having great pain in his back, which appeared to be located deep in the lumbar region, and had not been benefited by any medication. My attention was especially directed to him by a brother medical officer, under whose care he had been for a considerable time, with the statement that he was an inveterate malingerer. Struck with the appearance of this man's countenance, which indicated, as it seemed to me, great physical distress, I subjected him to a searching physical examination, and, in the course of it, found that he had an aneurism of the abdominal aorta, the sac of which was almost as large as my fist. The pulsation and the aneurismal thrill were strongly marked, and the aneurismal bruit was distinctly heard on using the stethoscope with proper care. Ultimately, this aneurism burst into the transverse colon, and the patient died of hemorrhage. From the day when I examined that man till the present time, the presence of a chronic persistent pain in the back has always led me to inquire specially into the condition of the aorta.

Concerning the symptoms produced by thoracic aneurism, Dr. Crisp remarks that they depend much upon the situation, size, and amount of pressure exerted upon the surrounding organs by the aneurismal tumour, together with the condition of the heart and valves. When located in the ascending aorta, the sac is generally smaller, and the pulsation is heard more distinctly on the right side of the median plane than elsewhere; and

if the tumour appears externally it is situated mostly on the right of the sternum. When located in the transverse portion of the arch, the sac usually projects backwards, or upwards and backwards; and when situated in the descending thoracic, it generally extends towards the left side of the spinal column, often producing absorption of the bodies of the dorsal vertebræ with which it comes in contact, and occasionally protruding externally. The pressure resulting from the progressive expansion of the aneurismal tumour may be exerted upon the lungs, trachea, bronchi, and recurrent laryngeal nerves, producing cough, dyspnœa, orthopnœa, hæmoptysis, loss of voice, and a sense of suffocation; upon the œsophagus, occasioning dysphagia and simulating stricture of that tube; upon the vena cava superior, producing turgescence of the jugular veins, together with more or less stagnation of the blood throughout the head, neck, and upper extremities, and, in rare examples, occlusion of the vena cava itself; or upon the thoracic duct, producing debility, emaciation, and, ultimately, death by starvation. Pains, sometimes of a dull, at others, of a lancinating character, are felt over the seat of the tumour, and they often extend to the shoulder, elbow, and fingers. In one instance, Dr. Crisp saw œdema of the hand. Some patients having thoracic aneurism exhibit an anxious countenance, and are troubled with frightful dreams, startings from sleep, etc. In others, dyspeptic symptoms, such as flatulence, gastrodynia, acidity, eructations, and vomiting, are present. This derangement of the functions of the stomach, which results from the pressure exerted by the aneurismal sac upon either the pneumogastric or the sympathetic nerves, is a very common attendant upon thoracic aneurism; and numerous patients affected with this disease have been treated for indigestion. But the error that is most frequently committed in the diagnosis of thoracic aneurism, consists in attributing the pain, which is so often met with in the chest, and occasionally in the shoulders and arms of persons affected with this disease, to rheumatism. This mistake was made in Cases II. and VI., as we have already seen. If, however, the symptoms are thoroughly investigated, and the peculiar character of the pain is taken into account, these errors will be less frequent. For example, the patient will, in some cases, complain of being attacked with pain after a blow, strain, or fall; in others, after great physical exertion or mental excitement. In the history of Case VIII., that of John Duck, it is related that this man was seized with pain and distress in his chest directly after he had overtasked himself in lifting. The nature of the pain produced by aortic aneurism depends much upon the degree of pressure exerted by the tumour, and the structure and office of the parts that are pressed upon; if a nerve of sensation be involved, it will be neuralgic in character, and will shoot along the course of the nerve, at intervals, to its extremity of distribution; if bony structures be implicated, it will generally have a dull, heavy, aching character; sometimes also shooting and lancinating, and occasionally burning. In some cases where the

aneurismal tumour is small, and the adjoining structures not involved, but little, if any pain is present. In some rare instances, where the sac is even large, and the structure and position of the surrounding parts much altered, but slight suffering has been experienced. Dr. Law, of Dublin, justly attaches much importance to the dull aching pain in the back, which is generally present in cases of aneurism, involving either the descending thoracic or abdominal aorta. He says: "On the whole, then, the pain when present seems to us the least doubtful sign of aortic aneurism. At least, we feel bound to say, its beacon light has guided us more than any other to detect disease." I suppose that the subjective, and not the objective, signs of the disease are here referred to. Some patients afflicted with these forms of aortic aneurism feel distinct pulsation on pressing the spine against a hard substance; and, according to Dr. O'Bryen, a good method of examination in cases where the disease affects the descending thoracic, consists in placing one hand on the sternum and the other on the back. (*Crisp's Treatise on Diseases of the Bloodvessels*, pp. 128, 129.)

The radial pulse does not appear to be affected by thoracic aneurism unless the innominata or the left subclavian artery is obstructed by the disease. If the innominate artery be partially occluded by coagulated blood, or by the pressure of the aneurismal tumour, the pulse in the right wrist is generally weakened thereby; if that vessel be completely occluded, the pulse in the right wrist can no longer be felt. If the left subclavian artery be either partially or completely closed up by the aortic aneurism or its contents, the pulse in the left wrist becomes either proportionally weakened or disappears altogether. Dr. Billing has described a condition of the pulse which he calls "resilient," and considers to be characteristic of aortic aneurism (*op. cit.*, p. 130), but I am not familiar with it.

The *physical signs of aortic aneurism* are, if the tumour can be felt externally, that is, examined from the exterior of the body, mainly such as belong to surgical aneurism in general. The aneurismal sac pulsates synchronously with the contractions of the heart, and, generally, each pulsation of the tumour is accompanied by a peculiar jarring sensation called the aneurismal thrill, and by a peculiar sound, which is usually more or less harsh in tone, called the aneurismal bruit. A feature in the pulsation of aneurismal tumours, which is singular and quite characteristic, is that the sac does not rise up or move in only one direction, but expands outwards in all directions with the impulse of the blood, and this may generally be discerned without much difficulty by grasping the aneurismal tumour with one or both hands. But, aortic aneurism cannot be subjected to manual examinations, unless the disease is located in the abdomen, or, when situated in the chest, the aneurismal sac projects above the manubrium or through the thoracic walls. In a large majority, however, of the cases of thoracic aneurism, the sac does not protrude externally, and, therefore, the tumour cannot be examined with the sense of touch. In such cases the

physical signs are only such as may be recognized and appreciated with the sense of hearing. These signs are flatness or dulness, detected by percussing the walls of the chest over the seat of the aneurismal tumour, and a blowing, rasping, or grating sound heard by auscultation in the same locality. The blowing or bellows sound is mostly heard if the aneurism be small and contains but little coagulum; in large aneurisms filled with coagula, this sound is often absent. Dr. Law, Gendrin, and others, state that a double sound is generally present in thoracic aneurism (*op. cit*, pp. 130, 131). Gendrin says that the second sound is not perfectly isochronous with the diastole of the ventricle. I can readily understand why a second sound might be present in an aneurism of the ascending aorta, provided there was insufficiency on the part of the aortic valves, and regurgitation of the blood into the left ventricle following each contraction, but, at the same time, I should expect the aneurismal sound to be more or less completely masked by the heart sound. And when we come to reflect how frequently aneurism of the aortic arch is accompanied by organic disease of the heart, we are ready to estimate aright the value of the auscultatory sounds of thoracic aneurism in a diagnostic point of view.

The symptoms produced by thoracic aneurisms are exceedingly liable to be mistaken for those connected with other diseases. We have already seen that the pains in the chest, shoulders, and arms are often erroneously referred to a rheumatic origin. The same mistake is commonly made with regard to the pain in the back, sides, loins, etc. Again, when the aneurismal tumour compresses the lungs and air-passages it may be erroneously supposed from the cough, dyspnœa, occasional hæmoptysis, etc., which are not unfrequently present, that the patient has phthisis pulmonalis. On this point Hodgson, a high authority, says: "There is, however, one circumstance, independent of others, which in some instances will probably assist us in forming the diagnosis: in phthisis the expectoration is either puriform or thick and clotted; but in aneurisms which are not accompanied with disease in the lungs, as far as I have observed, it always consists of a thin, frothy mucus." (Vide *Hodgson on Diseases of Arteries and Veins*, p. 93: London, 1815.) By taking into account the whole history and progress of the case, together with the physical signs, important assistance will also be derived in coming to a correct conclusion. When the aneurismal tumour presses upon the recurrent laryngeal nerves, spasm of the laryngeal muscles is produced, and it may be erroneously supposed that the patient has laryngitis; but in such a case the employment of the laryngoscope will at once expose the error. The aneurismal tumour compressing the trachea and bronchi may induce spasm of the bronchial muscles, accompanied with great difficulty in breathing, and thus lead to the conclusion that the disease is asthma. Again, when the aneurismal tumour compresses the œsophagus it produces dysphagia, and not unfrequently occasions the surgeon to suppose that stricture of that tube is present. If, under

such circumstances, an attempt were made to pass an œsophagus bougie into the stomach, it might cause the aneurismal sac to be ruptured, and occasion the patient to die, as it were, under the surgeon's hand. Hence Erichsen advises that, in all cases of difficulty of deglutition, dependent on lesion of the œsophagus, the thorax should be examined with a view to ascertain whether thoracic aneurism is present, before any treatment by dilatation is undertaken. Finally, a pulsating empyema has been mistaken for aortic aneurism; and Dr. Crisp admits that he once committed this error. (Vide *op. cit.*, p. 133.) It may, for the most part, be avoided by subjecting the pulsating tumour and the neighbouring parts to a careful examination by auscultation and percussion, as in that manner the real character of the disease can scarcely fail to be ascertained, especially if the general symptoms, including the history of the case, are, at the same time, allowed to have due weight in the formation of an opinion. Scrofulous tumours at the root of the neck offer in general but little liability to be mistaken for internal aneurism, since their multiple character, their indurated feel, their uneven exterior, their pulsation occurring in only one direction, namely, *from* the artery in contact with which they are placed, almost always plainly indicate their real nature.

The *diagnosis* of aortic aneurism is a matter of considerable importance to the surgeon who is about to operate for the cure of aneurismal disease in the surgical regions of the body, for by paying attention to it he may save himself from regret and mortification. Sir Astley Cooper once lost a patient upon whom he was operating for popliteal aneurism, from the bursting of a small aneurismal tumour of the ascending aorta. The patient died during the operation; and four cases of a similar kind are related in Dr. Crisp's table of aneurisms, as occurring either during or after the operation. (Vide *op. cit.*, p. 128.)

Treatment of Internal Aneurism.—But, *cui bono*, is a question which will doubtless be asked by some of the readers of these pages. What practical benefit will accrue to our patients from a more careful, exact, and thorough application of our knowledge of this variety of arterial disease? We answer that, by so doing, we shall secure manifold benefits to those afflicted with internal aneurism, more especially to those having the aortic form of it. For example, those who have thoracic aneurism will less frequently, through error in diagnosis, be subjected to treatment for rheumatism, or asthma, or chronic bronchitis, or pulmonary consumption, or stricture of the œsophagus—treatment which, in many cases, has proved to be not only useless, but also highly detrimental to this class of patients. Moreover, they will not be subjected to the operation of tracheotomy, on the erroneous supposition that they have disease of the larynx or trachea, as I have seen happen in one instance of thoracic aneurism, and as has doubtless occurred in many other cases of this disease. Furthermore, the real nature of their disease being known, remedial measures may be suc-

cessfully employed to procure relief from suffering, to retard the progress of the disease and to prolong life, and, *possibly*, to effect a permanent cure of the patient. On this point, Hodgson uses the following strong language: "It is scarcely necessary to cite authorities to prove the possibility of arresting the progress of aneurisms by a practice suggested by Hippocrates, and confirmed by the experience of Valsalva, Albertini, Morgagni, Lancisi, Guattani, Sabatier, Pelletan, and Corvisart. I cannot, however, avoid expressing my conviction, that if it were rigidly adopted, internal aneurisms would not be regarded as constantly fatal, which opinion has hitherto paralyzed that assistance which art can afford in their treatment. The practice is founded upon reason, and experience has amply proved its importance, but its merits have not hitherto been generally appreciated." (Vide *Hodgson On Diseases of the Arteries and Veins*, pp. 149, 150, 151, London, 1815.) He states further that Pelletan has narrated fourteen cases of aneurism, every one of which was materially benefited by this practice, and in two of them permanent cures appear to have taken place.

Now, the *practice* which is here referred to, is that which constitutes the *medical treatment* of aneurism. It is so called in contradistinction to the *surgical treatment* of that disease which consists in the employment of some operative procedure, such as the application of either the ligature or compression; the ligature being employed at the present day either on the principle of Hunter, or that of Anel, or that of Brasdor, making use of the plan best adapted to the case. Compression is applied at this day only to the arterial trunk between the aneurism and the heart, and not to the aneurismal tumour itself, as was practised by the ancients. Acupressure is also coming into favour in the surgical treatment of aneurism in the extremities of the body.

It is obvious that the surgical methods of treatment cannot be employed for the relief of internal aneurism, unless the disease be located in the innominate artery, or in the first portion of the course of the left carotid or the left subclavian. For such aneurisms it may be found advisable to employ the ligature after the method of Brasdor; at all events, it may be quite optional with the surgeon to use that plan of surgical treatment; but for the great mass of internal aneurisms no plan of operative treatment whatever is admissible. Hence, we come legitimately to the consideration of the medical treatment of aneurism, which is adapted exclusively to the relief of internal aneurisms, and never to that of external aneurism, according to the prevailing surgical views upon that subject at the present time.

After a long analytic, observative, historical, and exhaustive dissertation upon the spontaneous cure and medical treatment of aneurism, Mr. Hodgson (*op. cit.*, pp. 163, 164), says, and to his statements very little is to be added from more recent observations: "I think I am warranted in the following conclusions:—

"First. The deposition of coagulum in the cavity of the aneurismal sac and the artery leading into it, is the mode by which the spontaneous cure of aneurisms is, in most instances, effected.

"Secondly. The coagulum is subsequently absorbed, and the sac and the artery leading into it subsequently contract, until the one becomes an impervious cylinder, and the other a small fleshy tumour.

"Thirdly. In some instances the cure is effected by the obliteration of the cavity of the sac without any obstruction taking place in the calibre of the artery from which the disease originates; in this manner a cure may take place in aneurisms of the aorta.

"Fourthly. The formation of coagulum being a general occurrence in aneurisms, it is an important object to prevent the increase of the sac, that the deposition of coagulum may proceed to such an extent as to obliterate its cavity.

"Lastly. It is the force of the circulation which causes the enlargement of the sac, and its ultimate rupture; hence, the diminution of the force of the circulation is the principal indication in promoting the spontaneous cure of aneurisms." (*Op. cit.*, pp. 163, 164.)

The principal indication to be accomplished in the *medical treatment* of aneurism is very clearly pointed out in the last paragraph. Hodgson elsewhere also says: "On this subject it is sufficient to observe that the general means of diminishing the force of the circulation are repeated bloodlettings, abstinence, attention to diet, perfect quietude, the absence of such states of the mind as peculiarly affect the circulation, and attention to the condition of those organs, more particularly of the alimentary canal, which exert a peculiar influence over the action of the heart and arteries." (*Op. cit.*, p. 145.)

With regard to bloodletting as a leading part of the medical treatment of aneurism, Morgagni (Letter 17, art. 30) says: "When Valsalva had taken away as much blood as was requisite, he made it a custom to diminish the quantity of meat and drink more and more every day till he came so far as to allow only half a pound of pudding in the morning, and in the evening half that quantity, and nothing else except water, and this also within a certain weight. After he had sufficiently reduced the patient by this method, so that he could, by reason of weakness, scarcely raise his hand from the bed in which he lay by Valsalva's order, from the very beginning of the disease, he increased by degrees every day the quantity of aliment until the necessary strength returned." The reader will here observe that, in addition to copious bloodletting, Valsalva likewise enjoined upon the patient severe abstinence from food and drink, and the maintenance of absolute quietude in bed.

Hodgson remarks as follows on the same points:—

"The danger of inducing other diseases will, in some instances, forbid the employment of this debilitating treatment, or at least will prevent its being

carried to a sufficient extent to produce permanent benefit. With a view to obviate the probable effects of extreme depletion, it is desirable that the debility which it induces should not be continued longer than is necessary to arrest the immediate increase of the tumour, and that the force of circulation should subsequently be moderated by great tranquillity and attention to diet. The object of sudden depletion is to prevent the enlargement of the sac; the subsequent deposition of coagulum in its cavity is a slow and gradual process. In most instances, therefore, it will be sufficient to arrest the progress of the disease by depletion; when this is effected, the danger of inducing other diseases by the continuance of the debility, may be obviated by a diet nutritive in its quality, though small in quantity."

The same writer further says :—

"It is desirable that the bleeding should not be carried to such an extent as to produce fainting when the disease is situated in the aorta; for the blood is liable, during that state, to accumulate[1] in the aneurismal sac, and to form an impediment to the circulation when the action of the heart revives. I have known fainting, under such circumstances, continue so long as to excite considerable alarm. Morgagni[2] mentions an instance in which it terminated in death. The bleedings, therefore, should be small in quantity and frequently repeated so as to obviate this effect; for the same reason it is desirable that the blood be taken away in a small stream rather than suddenly, and through a large orifice. It probably was with this view that Pelletan[3] merely opened the vein in one of his patients, and did not apply a ligature to the upper part of the limb so that the blood was allowed to dribble slowly into a napkin." (*Op. cit.*, pp. 160, 161.)

But while venesection, a spare diet, and repose of both body and mind together constitute the most powerful of all the means at our disposal for diminishing the force of the arterial impulse, there are also certain remedial agents in the shape of drugs which may be usefully employed in the treatment of aortic aneurism. Thus, Hodgson states that he has seen *digitalis* administered with a view to diminish the action of the heart and arteries, in the treatment of aneurisms, and in some instances with apparent benefit, more especially when the disease was accompanied, as is frequently the case, with dropsical effusions (*op. cit.*, p. 162). Dr. Crisp, however, thinks that it should be given with great caution in the aneurismal cases which are complicated with disease of the cardiac apparatus (*op. cit.*, p. 136).

In the fluid extract of *veratrum viride* we have a remedy that acts, when properly administered, with great promptness and certainty in diminishing *both the force and frequency of the heart's contractions*, and hence its great value in the treatment of many inflammatory disorders of a sthenic type. The writer is of the opinion that this medicine may also be advantageously exhibited in the treatment of internal aneurism. It appears to exert a much more prompt, certain, reliable, and controllable influence over the force of the circulation than digitalis, and, therefore, I think it

[1] Does not our author here mean to say that when venesection is carried to the extent of producing syncope, the blood is liable to *coagulate* in the aneurismal sac and thus, by means of *thrombus*, to offer impediments to the circulation? Such an explanation has at least the merit of being easily understood.

[2] *Vide* Letter XVII. art. 32.

[3] *Vide* Clinique Chirurgicale (tom. i.) Deuxième Observation.

will be found more useful than that remedy in the treatment of internal aneurism.

Again, it is often necessary to administer palliative remedies with a view to procure relief from suffering in treating this disease. Dr. Crisp says, that in cases where much pain is present, the preparations of opium will afford the greatest relief; and, in some cases, large doses of this drug may be required. He mentions a patient of his, who suffered excruciating pain in the right arm and shoulder, but found great comfort from sprinkling the raw surface produced by a small blister, with the hydrochlorate of morphia. Belladonna and opiate plasters have also been found beneficial (*op. cit.*, p. 136). As we have elsewhere shown, the stomach in cases of either thoracic or abdominal aneurism is, from the compression of some portion of the nervous apparatus connected with that organ produced by the aneurismal tumour, not unfrequently affected with pain or distress (gastrodynia), flatulence, acidity, pyrosis, vomiting, etc. Such cases require the administration of antacids, carminatives, sedatives, and anodynes in order to procure temporary relief. Sometimes the administration of bismuth, or a solution of carbonic acid in water, or the chloroform mixture has been found very useful in such cases.

Reference has already been made to the applicability of the operation of Brasdor for the relief of internal aneurisms developed from certain branches of the aorta, such as the innominate, left carotid, and left subclavian, to which the primitive iliac should also be added. The importance of the subject seems to demand that brief additional consideration should be here given to this matter.

Now, it is well known that aneurismal tumours are not unfrequently developed from the above mentioned branches of the aorta, together, with the right carotid and right subclavian at the root of the neck, in such a way, with respect to size, shape, position, and relations, that it is impossible for the surgeon to apply a ligature to the artery between the aneurismal swelling and the heart, that is, to tie the vessel on the *proximal* side of the aneurismal sac in accordance with the principles of surgical treatment for that disease, which were enunciated, first, by M. Dominique Anel, a French surgeon, in the year 1710, at Rome, and, afterwards, with important improvements, by John Hunter, in the year 1785, at St. George's Hospital in London; and that the cases wherein the vessels affected with aneurism (spontaneous) cannot be operated on by the methods of Anel or Hunter, have, for the most part, been deemed incurable.

Brasdor, however, a professor in the School of Surgery at Paris, about eighty years ago, which was about the time that the operation of Hunter was attracting much attention, made the proposal in his lectures to operate for the cure of aneurism, by a new method, which consisted in the application of a ligature to the affected artery, on the *distal* and not on the *cardiac* side of the sac, as recommended originally by Anel. The proposal of

Brasdor was, however, first practised by Deschamps, in 1799, and was afterwards repeated by Sir Astley Cooper, but both cases terminated fatally, and the operation appears to have fallen into disuse, until it was revived by Wardrop, in 1825. This surgeon became the champion of the operation, and wrote an excellent treatise upon it, which was published in London in 1828, in which he shows that the operation of Brasdor is not of necessity fatal, that the cure is effected by it in precisely the same way as in the Hunterian operation, viz., by the coagulation of the blood in the aneurismal sac, and, finally, he points out the class of cases to which the operation is specially adapted; and it consists of certain forms of aneurism which cannot be operated on by the methods of Anel and Hunter, but can be by the method of Brasdor. He gives an account of four cases of carotid aneurism, seated at the root of the neck, and belonging to this category, which were operated on by the method of Brasdor. Of them two recovered and two died. One of the deaths, however, was occasioned, not by a return of the aneurism, or by hemorrhage, but by another disease. He also relates a case of aneurism of the innominata and root of the carotid arteries, which was treated successfully by D. Evans, Esq. by tying the primitive carotid; and he elsewhere points out as the reason why the operation of Brasdor is remarkably successful when performed on the primitive carotid artery, the fact that no branches of magnitude are given off from it between the aneurismal sac and the place of operation, and hence the blood is likely to stagnate and coagulate in the sac without delay, and the tumour also diminish rapidly in size. In his concluding observations Mr. Wardrop remarks:—

"The cases of aneurism in which the Hunterian operation is not applicable, are chiefly those of the carotid and subclavian arteries, of the arteria innominata, and of the iliac arteries, where the tumour is formed so near the heart, and has acquired such a bulk as to render placing a ligature on the artery between the tumour and heart an impracticable operation. It is in such cases, I conceive, that the new operation may be peculiarly applicable, a class which, from their formidable and hitherto untractable nature, have generally pursued a fatal course." (*Wardrop on Aneurism and its Cure by a New Operation*, London, 1828, pp. 82, 83.)

An excellent account of this operation and the various practical considerations which are connected with it, may be found in *Erichsen's Science and Art of Surgery*, and in vol. iii. of *Holmes' System of Surgery*.

Why may not the medical plan of treatment be successfully combined with the operation of Brasdor for the cure of these aneurisms?

332 SIXTH AVENUE, NEW YORK, October 25, 1866.

ART. III.—*Trichiniasis.* By JOHN D. JACKSON, M. D., of Danville, Kentucky. (With four wood-cuts.)

BY the observations of Zenker, in 1860, we have been enabled to add a new disease to the already long nosological catalogue, and what is certainly exceptional in medicine, coincidently with its isolation and description as an individual affection, we have a clear and demonstrable knowledge of its etiology.

The disease to which we allude is of parasitic origin, and has been called by its discoverer TRICHINIASIS, from the name of the entozoon producing it—the *trichina spiralis.* The generic portion of the name of the animal is derived from the Greek word θριξ-τριχὸς—a hair, in allusion to its filiform shape; the specific part—*spiralis*, from the Latin word *spiralis*, indicating the spiral, watchspring-like form it assumes when curled up within its cyst.

Though a knowledge of the malady to which the parasite gives origin is but recent, yet the existence of the animal and to a certain degree its natural history, had long been previously known. Hilton, of Guy's Hospital, London, in 1832, while dissecting the body of an old man who had died of cancer, observed the pectoral muscles to be thickly sown with minute white specks; he published his observations in the *London Medical Gazette* in February of the year following, and was thus the first to put on record a notice of what subsequently was demonstrated to be the capsules or cysts of trichinæ; if a doubtful observation by Tiedemann, ten years previously, of what has been supposed by some from his description to have been the same thing, be excepted.

Be this as it may, neither had a true knowledge of what he viewed, and the credit of the discovery of *trichinæ* must be given to James Paget, then a student at St. Bartholomew's, who, while dissecting a body early in February, 1835, and perceiving the muscles to be filled with what were supposed in the dissecting-room to be minute bony spiculæ, examined them with a lens and found that they were cysts, each containing a small worm coiled up in it. He was desirous of examining them microscopically, and for this purpose borrowed a simple dissecting microscope of Mr. Robert Brown, with which he was able to observe structures in the worm before invisible. As soon as the discovery was made known in the dissecting-room, portions of the muscles were distributed far and wide, and among others to the comparative anatomist, Robert Owen. As the discoverer of the entozoon, Paget was invited to communicate his observations to the Abernethian Society, which he did on the 6th of February, and an abstract of them was recorded in the *Transactions* of the Society.[1] On the 24th of the same month Professor Owen presented to the Zoological Society his

[1] *Vide* Letter of Paget to London Lancet, March 5, 1866.

memoir containing a "Description of a microscopic entozoon infesting the muscles of the human body," subsequently inserted in the Society's *Transactions*, and in the *London Medical Gazette*, April, 1835. This was the first publication on the subject, and in it Owen gave the animal the name which it has since retained—*trichina spiralis*. He, however, described the worm as destitute of intestinal canal and organs of generation, and classed it in a very inferior scale, among the helminthes. During the same year Dr. Farre published his observations upon a new subject in whom the trichinous cysts were found. He discovered an intestinal tube and organs of generation, which placed the worm in a higher rank of organization, and enabled him to assign it a place among the class nematoides (νημα, thread, and ειδος, like). He also observed that the striated muscles, the heart excepted, alone contained the cysts. In May, 1835, Dr. Henry Wood, of Bristol, gave, in the *London Medical Gazette*, an account of a case of what he diagnosticated a violent attack of acute rheumatism complicated with cough and dyspnœa. The patient, a young man aged twenty-two, had been sick a fortnight, and confined to his bed six days previously to his being brought on the back of his father to the Bristol Infirmary, where he died on the tenth day after his entrance. An autopsy exhibited pneumonia in the first degree and extensive pericarditis; and upon examination trichinæ were found in the muscular fibres of the chest and shoulders in great numbers, and in a less degree further from the thoracic region; "being most apparent in the pectoral and deltoid muscles, less so in those of the arm, and becoming still fewer in the legs. (Fritz.) The trichinæ had not become encysted.[1]

Though evidently now a case of *trichiniasis*, Wood was unable to detect the true cause of the affection, though in his paper he makes the very suggestive inquiry—whether in the subjects in which the trichinæ described by Owen and Farre had been found, there had been observed any symptoms of rheumatism or inflammation of the muscles?

In the same year Harrison, in the *Dublin Journal*, placed on record six observations. In 1840, Kobelt and Bischoff published an account of an autopsy made at Heidelberg of a body infested with trichinæ. Bischoff confirmed Farre's observations upon the anatomy of the worm, though he fell into the same error with him in mistaking the attenuated end of the animal for its tail, and consequently describing the mouth as the anus. He, however, pointed out the true character of the fatty granules situated so frequently at the polar extremities of the capsules, and which it seems had been mistaken by Owen for trichinous germs. He also declared the capsules to be made up of two distinct envelopes, an internal spherical, and an external ovoidal one, and observed, besides, the tenacious vitality of the parasites, which exhibited their movements at the expiration of fifteen days, when the muscles inclosing them had become completely putrefied.

[1] A. Farre. Observation on the Trichina Spiralis, Lond. Med. Gaz., 1835.

The development of trichinæ he could only explain by supposing a spontaneous generation. From 1842 to 1845 observations were published in this country by Drs. Bowditch and Jeffries Wyman,[1] of Boston, and in Copenhagen by Mönster and Soytzer.

During this time the origin of the worm was enveloped in mystery, Bischoff's theory of spontaneous generation in the mean while not being without supporters; Dujardin, in his work upon the helminthes, declaring —"l'apparition de ces *trichina* est encore un des plus puissants arguments en faveur de la generation spontanée de certains helminthes."[2]

This explanation, however, was rejected by most physiologists, who, with Virchow at their head, contended for the truth of the ancient aphorism, "omne vivum ex ovo," and supposed the worm to be the development of the egg direct, or the transition state of some other animal, which latter theory derived the strongest support from the discoveries then recently made by the Danish naturalist Steenstrup, regarding alternate generation or equivocal reproduction.[3] Some additional colour was given to such supposition by the discovery of trichinæ in the cat in 1845, by Herbst. (Fritz.) The strongest support to the doctrine, however, was derivable from the discovery of trichinæ in pork (ham) in 1846, by Professor Leidy, of Philadelphia.[4] This may be deemed the most important discovery since that of Paget,

[1] Boston Medical and Surgical Journal, 1842, 43, 44.

[2] Dujardin. Histoire naturelle des helminthes, 1845, p. 293.

[3] The observations about that time published by Steenstrup are to the naturalist very curious, and exceedingly interesting. He found at certain periods of the year in the viscera of one of our fresh-water mollusks, the Limnea, a quantity of little worms with well-marked head and two posterior projecting limbs; these, under the microscope, were discovered to contain within the cavities of their bodies masses of other little worms recognized by the naturalist as young Cercariæ. The Cercariæ increasing in size would distend the worms containing them, which seemed to have for their office the protection and development of the cercariæ within them, and hence called the *nurses*. After growing to a certain size the cercariæ would leave the body of the nurse and move freely in the abdominal cavity of the mollusks; or, escaping into the water, fix themselves in turn upon the body of another mollusk, and dropping the tail, now no longer useful to them, be converted into encysted larvæ, known as Distomæ, and thus be ready to begin their transformation anew. The nurses in turn he demonstrated to be the offspring of little worms of another kind, termed *grand nurses*. These were supposed to be immediate offspring of the Distoma, the larval state of the Cercariæ; four generations and a metamorphosis being requisite to complete evolution—the parent animal finding no resemblance to itself in its progeny until it comes down to its great grand offspring. Among the plant lice (*Aphides*), the number of reproductions is still greater, for it is sometimes not until the eighth or ninth generation that the animals, previously asexual, appear as males or females. At this period the sexes are for the first time distinct, and the males provided with wings.—*Vide* Steenstrup's Alternation of Generations, Ray Society, 1845. Also Gould and Agassiz's Zoology, Chapter on Alternate and Equivocal Reproduction.

[4] Proc. Acad. Nat. Sci., Phila., Oct., 1846, p. 107.

since by means of it a direct connection between the entozoon and the food of man was deducible. During several years succeeding, however, the researches seemed to be confined to the anatomy of the worm. In 1851, Luschka pointed out the attenuated filiform portion of the animal as its head, and further minutely described its structure, though he could not observe any genital organs, which were subsequently demonstrated, together with other points in its minute anatomy, by Leuckart, and Bristowe, and Rainey.

In 1855, Leuckart, Zenker, and Küchenmeister commenced experimenting upon different animals, forcing them to swallow human trichinous flesh. The experiments were but partial in their results, for some reason the muscles of the subjects of their experiments not being penetrated. From his experiments Leuckart nevertheless demonstrated the freeing of the trichinæ from their capsules, and a development, three days after entrance into the intestines, to thrice their primitive length; and from the previous discoveries made by Siebold, Van Beneden, and himself, upon the metamorphosis of the *Cysticerci*, came to the conclusion that trichinæ represented an inferior grade of development of *Tricocephalus dispar*, which error seems to have been generally entertained, until, by his experiments in 1860, observing the trichinæ to undergo complete sexual development and give birth to living young, he thus demonstrated the erroneousness of the opinion. Leuckart's observations had been made upon the dog, an animal which has been since found, as a rule, to be insusceptible to trichinous infection, though the worms will readily undergo development within the intestines and give birth to their young. He supposed that before transmission to man, possibly the young intestinal trichinæ must be ingested by another animal—a conclusion readily drawn by analogy from the result of the studies of the mode of propagation of tænia. With this view he gave a dog's intestines which contained trichinæ to a pig, an animal which he knew, by the observations of Leidy, to be susceptible of trichinization. By his experiments upon the pig and other animals he learned that the young trichinæ commenced their migrations from the intestines, when they were developed, toward the muscles, about the eighth day after the food containing them had been ingested, and that in the intestines of the hog, cat, rabbit, mouse, and barnyard fowl, trichinæ would attain their complete sexual development.[1]

It was while Leuckart was in the midst of his experiments that Zenker made his ever memorable discovery, and sent a portion of the trichinous muscles of his patient to Virchow. This he fed to rabbits, and the results following were fully confirmatory of those arrived at by Leuckart. Says Virchow:[2]—

[1] Zeitschrift fur Rationelle Medicine, III., R. VIII. Bd. 1860, 5 Mars. Quoted by Fritz in Gazette Hebdomadaire, 20 April, 1866.

[2] Virchow. Note sur la Trichina Spiralis. Comptes Rendus de l'Académie des Sciences, t. LI., p. 13, seance du 2 Juillet, 1860.

"It was upon rabbits that I was able to follow the development of trichinæ. Upon making a rabbit eat flesh containing trichinæ, the animal was seen to grow poor; in three or four weeks thereafter its forces diminished sensibly, and it died toward the fifth or sixth week which followed the ingestion of the food containing the entozoa.

"By this alimentation I have obtained five generations of entozoa. I at first made a rabbit eat living trichinæ occupying human muscle; it died at the end of a month. I then caused the muscles of the first rabbit to be ingested by a second; it died also a month after. The muscle of this served me to infect three others: two of them dying three weeks after, and the third at the end of a month. With these last I fed two others, one with much, and the other with but little of the flesh. The first died at the end of the eighth day without my autopsy revealing anything but an intestinal catarrh; the second succumbed six weeks from the time of performance of the experiment.

"With all of these animals, with the exception of the one before the last, all the red muscles, save the heart, inclosed a great quantity of trichinæ, so that each parcel examined under the microscope contained many, sometimes even a dozen."

Until 1860, although trichinæ had been so frequently observed in the human subject, as far as we are aware, if we except the case of Wood, there seems to have been no suspicion entertained of their hurtfulness, their presence and development having been investigated purely in the light of scientific curiosity.

It was on the 12th of January, 1860, that a young woman, a servant, aged 20 years, entered the hospital of Dresden. She had taken sick about Christmas, and had taken to her bed on the first of January. She had at first suffered with great weakness, heat, thirst, loss of appetite, sleeplessness, and constipation. When admitted into the hospital she presented, besides intense fever, a tympanitic and painful abdomen, the *tout ensemble* of symptoms, in brief, indicating typhoid fever. Very soon there appeared violent pains of the muscular system, pains such that the patient groaned day and night; then there was a contraction of the knees and elbows, rendering all efforts at extension impossible, so great was her pain; later there was œdema of the members, especially the legs, a typhoid pneumonia manifested itself, and finally, on the morning of the twenty-seventh of February, she died. Upon holding an autopsy Zenker found the whole of the striated muscles filled with trichinæ, which gave unmistakable signs of vitality in their active movements. To such a degree had they penetrated that a magnifier of low power exhibited as many as twenty in the field of the glass, the primitive muscular fascia had lost their striæ and were friable. There was no other lesion which could be attributed to typhus.[1]

He also found male and female trichinæ which had undergone complete sexual development in the jejunum, together with a number of embryos.[2] On investigating the case, and tracing its origin, Zenker found that at the house in the country where the young woman had been serving as a domestic, there had been a hog killed on the twenty-first of December, which had been used as food by the family, and the ham and sausages made from it, he found filled with vast numbers of trichinæ, and, finally, that the butcher, who had killed the hog, and eaten of the sausages while fresh, together with many others, had fallen ill, though none ultimately succumbed, save the unfortunate woman who had been sent to Dresden. The persons

[1] *Vide* Kestner, Étude sur le Trichina Spiralis, p. 25. Paris, 1864.

[2] Fritz, Gaz. Hebdom., 20 Avril, 1866.

affected presented different symptoms more or less grave, which had been interpreted as gastro-intestinal catarrh, rheumatism, or typhoid fever, as the different phenomena predominated. The butcher's case was the one of most severity, and among other symptoms from which he suffered were pains and stiffness of the neck and extremities, which became, as it were, paralyzed, and which were supposed at the time to be an abnormal form of gout.

Zenker's observations being immediately reproduced by the medical journals, the attention of all Germany was at once directed to the subject. This terrible, and hitherto unknown source of disease, naturally placed every one on the alert, and since then to the present, counting isolated cases and *epidemics*, as they have not altogether inappropriately been called (for unfortunately from the nature of things, as it may readily be supposed, where the sources of infection exist, frequently a large number of persons become affected),[1] there have been published in Germany alone more than two thousand cases of trichinous infection. Among the most noted records may be counted that of the outbreak at Plauen and its environs, and published by Boehler and Koenigsdoerfer, there being between thirty and forty cases and one death. The account of a case at Heidelberg, by Friedrich,[2] Professor of Clinical Medicine, from the graphic relation of the symptoms, together with the apparent success of a remedy then for the first time tried, besides being the first case in which the diagnosis had been made and confirmed in an indisputable manner during life, attracted much attention in Germany. The epidemic of Magdeburg, Neustadt, and Buckau (1858—1862), described by Sendler, in which between three hundred and four hundred were said to have been ill. Those of Blankenbourg, studied by Scholz and Griepenkerl[3] (1859—1862), in which two hundred and seventy-eight cases were said to have existed, with one death in the garrison of the place, and a large number in the civil population. That of Calbe, described by Herbst and Simon, in which there were thirty-eight cases with eight deaths. The epidemic at Hettstadt, described by Rupprecht, the first having one hundred and fifty-nine cases with twenty-eight deaths; the last eight cases. And, finally, not mentioning a great number of smaller ones recorded, we have yet fresh before us, occurring in October of last year, the terrible epidemic of Hedersleben, the most widespread and fatal of any yet recorded, there having been three hundred and fifty cases, and eighty deaths.

As presenting lucidly the characteristic phenomena of trichiniasis we give Professor Friedrich's case in detail.[4]

[1] It is said that a single hog produced the outbreak at Hettstadt, and the terrible epidemic of Hedersleben was from two slaughtered hogs.

[2] Virchow's Archiv, 1862, t. xxv. p. 399.

[3] Griepenkerl, in April, 1864, had one of the sufferers of 1859 to submit to a muscular exploration. He found numerous encysted trichinæ, and thus fully confirmed a diagnosis founded on the history of the rational symptoms.

[4] Étude sur la Trichina Spiralis, par H. Kestner, Paris, 1864, p. 26. Étude sur

George Mischler, a butcher boy, aged twenty-two years, well formed and enjoying excellent health, after having eaten of raw minced-meat made from pork, was seized, on the 14th of April, 1862, with an extreme lassitude of the limbs, and great pain in the muscles, especially the gastrocnemii. This he was inclined to attribute to a drinking bout during the evening. About the same time, and without any initial chill, he experienced headache, heat, thirst, abundant perspiration, and loss of appetite. The man wished to work, and continued to carry around his meat in the city, but he mounted the stairways with great difficulty, the symptoms of his disease continuing to become aggravated. Each day he passed a liquid stool without colic; the muscles of the arms, and the loins and back, became painful, but there was no vertigo, nor pulmonary trouble. At last, however, being greatly enfeebled, he desired to enter the hospital.

At the time of his admission, the 24th of April, he presented the following symptoms: Violent pains in the muscles of the extremities, and at the nape of the neck, which were increased by any movement, pressure, or even the touch. The muscles were turgescent and elastic, yielding something of the sensation furnished to the touch by India-rubber. There was a stiffness and numbness of the members, with the articulations free and painless; he besides had a general feeling as if bloated (*d'enflure*). He could not sit up in bed, and if he made efforts to do so, experienced pain and stiffness in the inguinal region. Mastication, deglutition, and speech were perfectly intact. The abdomen was soft and painless. Neither the tongue, liver, spleen, lungs, nor heart exhibited anything particular. There was no bronchial catarrh, nor exanthematous rash. On the evening of the day of entrance, there was intense fever—visage red and hot, anorexia, tongue a little coated, feebly moist; urine acid, not albuminous; the pulse 108 pulsations per minute; temperature of the skin 106 F.

From the 25th to the 27th of April the same symptoms; the sleep was often interrupted, and there was slight delirium; two liquid stools without effort. The 28th, a feeling of profound weakness; pain in the muscles persistent, especially in the calves of the legs; slight epistaxis; two diarrhœal stools. The 29th he passed some joints of tænia; sweated abundantly for an hour.

The 1st of May muscular affection continues; the patient can neither sit up nor turn himself in bed; elbows demi-flexed; great pain on an effort being made to extend the arm; the inferior extremities extended and immobile. Sweatings profuse and continuous, hoarseness commencing, a dry cough, no rale, pain in speaking, vertigo disappeared, intelligence clear. Heat and thirst less marked than on the day preceding, loss of appetite, urine for the first time albuminous.

The 2d, no change.

The 3d, feebleness increased; sweating abundant, following the profuse transpirations; there have appeared upon the neck, chest, and abdomen innumerable miliary vesicles, containing a clear aqueous fluid.

The 4th, the same state.

The 5th, sweating persisting; numerous minute pustules, containing a milky fluid, surrounded by a red areola, show themselves beyond the miliary vesicles, upon the chest and abdomen. The pulse is less frequent, beating 90 strokes per minute; the temperature of the skin has fallen to 100 F.

Friedrich having diagnosticated *trichinous infection*, administered for the first time picronitrate of potash.[1] ℞.—Picronit. potas. ʒj; ext. glyc. glab.; pulv. glyc. glab. āā qs; ♏. ft. pls. No. lx. S. Five pills three times daily.

May 7th.—Stiffness of muscles, contraction of arms, feebleness and sense of fatigue, hoarseness and sweating all continue; eruption extended over the whole of the back; head free; tongue normal; one yellow liquid stool; sleep and appetite good; no albuminuria. The same day, by means of Middledorpff's[2] in-

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les Trichines et sur les Maladies qu'elles determinent chez l'homme par H. Scoutetten, Paris, 1866, p. 48. Translated from Virchow's Archiv.

[1] A double salt, composed of picrate potassa and nitrate of potassa—[$C^{12}H^2(AZO^4)^3OKO$].

[2] A three-quarters explorer, terminating in a sort of harpoon, designed to bring up some muscular fibres, which are easily cut as the stem re-enters the sheath.

strument, a little morsel, scarcely the size of a hemp-seed, was extracted from the right gastrocnemius muscle, and upon being subjected to the microscope, seven trichinæ were counted, most of which were enrolled "*en spirale*," and interposed between the muscular fibrillæ. The picronitrate of potash is continued in the same dose.

May 9th. Movements less painful; the patient can, with some effort, sit up in bed; the resistance of the muscles is less, the contraction of the arms yet remains, but there is less pain upon effort being made to stretch them; the sweats persist day and night, and the last pustules extend over the body. A furuncle, the size of a pea, has formed at the inferior angle of the shoulder-blade; the skin has mortified, just beneath this point, to the extent of an inch and a half. In the pus of the furuncle there was found a large and well-developed trichina. Heart, lungs, liver, and spleen remain sound; stools normal. The urine has taken a deep yellow colour, under the influence of the picronitrate of potash, and the conjunctiva has commenced colouring; appetite returning. Ordered strong soups and a little roast meat. Pulse 84 per minute; temperature of body 100° F.

12th. Less pain of muscles, stiffness diminished, can almost straighten the arms; sweats continue, especially at night; œdema of limbs no longer present; marked icterus extending over the whole surface, from the use of the picronitrate of potassa.

13th. Can make a few steps in the ward; symptoms all improving. Epidermis detached in flakes from the toes and soles of the feet.

20th. Artificial icterus everywhere intense, pulse and temperature normal; the patient takes a warm bath daily.

25th. The picronitrate of potassa suppressed. A second exploration of the gastrocnemius by the harpoon furnished a free and living trichina.

29th. Continued improvement; the urine, which had become almost black, has returned to its normal state; appetite satisfactory. A renewed experiment from the same place gave a spirally curved trichina, living, and already inclosed within a thin and oval capsule.

30th. Icterus sensibly diminished.

June 15th. A new exploration did not furnish trichinæ.

30th. The patient quit the hospital completely cured, after an illness of two months and a half.

This case of Friedrich's was remarkable for being the first in which the diagnosis was confirmed during the life of the patient by extracting trichinæ. It was also the first in which this picronitrate of potash was used, and which, from the results *apparently* following, was, until further use of it demonstrated its inefficacy, deemed a specific. Œdema of the eyelids and face, which has since been found to be so constantly present as to be deemed one of the most characteristic symptoms of trichiniasis, is not mentioned either because so slight as to have escaped notice, or as is most probable, because the phenomenon, which usually sets in towards the close of the first week of infection, had appeared and subsided before the patient had entered the hospital.

As further exhibiting the clinical phenomena of the disease, we give the following cases observed by Bœhler[1] and Kœnigsdorffer.

Louise Schneider, servant, aged 22 years, of a delicate constitution, chlorotic, had been suffering some days previously with pains in her extremities, which were manifest about the 17th of March, 1862. In the mean time, there was great lassitude in the members, and a rather sudden swelling of the face.

[1] Bœhler, Die Trichinenkrankheit und die Behandlung dersleben in Plauen, 1863. Also, Scoutetten, Sur les Trichinose, and Kestner, from whom we translate.

Dr. Kœnigsdorffer, her physician, after having lost sight of her for some days, saw her again on the 24th and could scarcely recognize her, so generalized had become the œdema.

The eyelids are markedly œdematous, as well as the extremities. Sweating continuous and abundant. The patient remains immobile in bed, the thighs and legs in a state of demi-flexion. The least movement occasions the most violent pains. Even the lightest pressure upon the muscles is equally painful. There is insomnia, cephalalgia, acceleration of the pulse, intense thirst, difficulty in opening the mouth, and protruding the tongue, which is moist.

Kœnigsdorffer, having made his diagnosis, made at first an observation of the gums, but without finding trichinæ. He repeated his trial four days after upon the biceps, and found for the first time living trichinæ.

Calomel and jalap, with santonine, were prescribed plentifully with a view of acting against intestinal trichinæ.

A peculiarity observed in the case was constipation and vesical tenesmus.

The symptoms, after having been intense, amended rapidly. By the 8th of April the œdema had diminished to a a degree sufficient to permit the patient to walk a little, and by the 4th of May she was in a state to quit the hospital.

Caroline Nenner, servant, aged 25 years, entered the hospital at Plauen, the 16th of March, 1862. The affection from which she was suffering had made its appearance eight days previously, by great weakness, anorexia, and a sudden œdema of the face which rendered the patient scarcely recognizable.

The symptoms present upon entrance were—face red, eyes injected, tongue red and moist; thirst intense; sweats; pulse 120; pains, and great lassitude in the arms and legs.

Diagnosis.—Rheumatismal fever. Prescribed aconite.

17th and 18th. Pains go on increasing; muscles of forearm seem tense and hard; the least touch and effort at movement increase the pains.

19th. The symptoms take on a mild typhoid character; cephalalgia, dryness of mouth and nose, insomnia, liquid stools. Morphia and emollient drinks now prescribed.

The following day, same symptoms, persistence of fever, insomnia and diarrhœa; the pains are general; œdema has appeared in the calves; sweating continuous and abundant. Prescribed morphia and ipecac.

It was only on the 24th, eight days after admission, that a true diagnosis was made, and which enabled M. Kœnigsdorffer to discover the real nature of the epidemic thus prevailing at Plauen. This he had been enabled to do by having read an article giving an account of Zenker's case, the similarity of which to the unusual symptomatology of several cases then sick in Plauen, put him on the right track of observation. At this time, the œdema, at first limited to the extremities, had successively invaded the whole body. Arsenic was administered.

28th. The dropsy had become general; the pains were intolerable and rendered all movement impossible. The diarrhœa is complicated with a violent tenesmus; sloughing over the sacrum is commencing. Arsenic continued.

29th and 30th. Slight improvement, except the perspiration, which remains profuse. The typhoid symptoms are gradually disappearing.

April 1st. An increase of the anasarca; the epidermis is broken in different places. The general state is otherwise satisfactory.

2d. A first exploration is undertaken upon the biceps; it furnished free, living, well-developed trichinæ.

A slow improvement going on. The arsenic is substituted by sulphur, then digitaline.

May 1st. The patient can lie upon his side, which facilitates the dressing of his bedsores.

7th. A pleuritic effusion, abundant on the left side, is manifest.

10th. A second exploration of the biceps yielded encysted trichinæ in great numbers. Many cysts inclosed two, and even three.

On the 14th of July, although the pleuritic effusion had not been entirely absorbed, the patient demanded her discharge, after four months' sojourn in the

hospital. She had lost all her hair within the last few weeks; but at the time of going out, it was commencing to grow again.

Nearly two years after, Feb. 1st, 1864, the subject of this observation died, and M. Bœhler found the muscles filled with living encysted trichinæ.

The cases given above may be deemed typical of *trichiniasis*. Though cases may differ more or less from each other individually, and certain symptoms assume a prominence in certain epidemics, or certain individuals, which may be lacking in others, yet taken in connection with each other, the disease may be said to be as well marked as almost any in the nosology.[1] The palpebral œdema may be deemed especially diagnostic. In the Plauen epidemic, just alluded to, so constant and marked was it that the common people designated those suffering from the affection by the expressive German word *Dickköpfe*.

The epidemic of Plauen differed from many others in most of the sufferers being constipated.

The fatal epidemic of Hettstadt, according to Rupprecht, in the beginning simulated cholerine; and the recent and more fatal one at Hedersleben was mistaken at first for Asiatic cholera, so that it is said many persons fled to the country and died. (*London Med. Times and Gaz.*, Jan. 6, 1866.)

Until the true etiology and pathology of the disease was learned, the cases now known to have been trichinous infection seem to have been usually pronounced *gastro-intestinal flux*, *rheumatismal fever*, or *typhoid fever*, just as a certain variety of symptoms were prominent, or the medical observer, from any preconceived ideas, may have seized and dwelt upon any phase of the disease.[2]

Clinical observers have generally divided the phenomena attending trichiniasis under several heads, founding their divisions upon the pathological conditions presenting as the parasites progress towards their ultimate destination. We have—

1. *The period of gastro-intestinal irritation* (*stadium ingressionis*, Rupprecht). This period is comprised within the first week or ten days of the affection, and has its symptoms depending upon the irritation of the intestinal canal by the development and movements of the larval trichinæ of the food ingested. The severity of symptoms being dependent upon the amount of the food taken, the difference of time in the access of trouble after taking the trichinous viands—after making allowance for difference of temperament in patients—being explicable on the supposition of a difference of encapsulation of the trichinæ in different instances, in certain ones the covering being very thin and easily soluble, while in others, where

[1] It is said that Friedrich did not hesitate, in the case recorded, to make a diagnosis based on the rational symptoms, in the face of twelve cases of typhoid fever which simultaneously presented themselves.

[2] The epidemic of Magdebourg was described as an *epidemic of acute œdema of the subcutaneous cellular tissue* (*scleroma adultorum*), and the one at Blankenbourg as the *grippe*. *Vide* Sendler and Scholz, Deutsche Klinik, 1862.

the covering has undergone calcareous degeneration, a much longer time being required for the intestinal juices to act upon the envelope to a sufficient degree to liberate the worm. Most individuals do not suffer the first day after taking infected food. The sufferers of Hettstadt were usually taken within the first forty-eight hours after a repast, and most generally in the night, says Rupprecht, with vomiting, diarrhœa, and violent colic; the disease being marked by nausea, cardialgia, a fetid breath, eructations, and anorexia, a general feeling of *malaise* and great weakness, rigors and flashes of heat, a heaviness of head, and vertigo. In some cases the symptoms had all the intensity of cholerine. The first period has nothing in it which might especially distinguish it from a case of gastro-intestinal irritation produced from any other cause.

2. *The period of muscular irritation* (*stadium immigrationis*, Rupprecht). This period is marked by an œdema of the eyelids and face, which, in the majority of cases, appears about the end of the first week. Occasionally it seems to have been absent, or to have been so slight as to have escaped observation, though these cases are certainly exceptional. Accompanying the œdema of the eyelids is a tension in the frontal region and at the root of the nose. The maximum of intensity is exhibited in lymphatic persons with a clear skin, especially girls and children, in whom the swelling invades successively the forehead, temples, and finally the whole face. The eyes become injected and watery, their movements painful, and very frequently photophobia and mydriasis exist. It is said that an ophthalmoscopic examination has exhibited the fundus of the globe, especially at the papilla of the optic nerve, as the seat of a characteristic œdema, and that the vessels of the retina are enlarged, and may be seen pulsating. There is also pain upon movement of the eyeball, and a diminution of the faculty of accommodation. Sometimes there is œdema of the tongue and glottis, or the cerebral meninges. The cellular tissue of the neck is hard and the veins swollen, which, by the stasis of blood thus produced, bring about the cerebral congestion. The hoarseness which is so commonly observed is produced by the immigration of the entozoa into the larynx; and, when the connective tissue of the pharynx is invaded to a great extent, there may be deafness from temporary closure of the Eustachian tube. The fever which has been lighted up about the end of the first week increases until the pulse ranges from 84 to 120 strokes per minute, the respiration 30 to 36, and the temperature of the body to 101 to 106° Fahr., as we saw in Friedrich's case. The bowels, if previously constipated, remain so; but if the affection set in with diarrhœa, it continues. The activity of the skin is great, the amount of perspiration being sometimes astonishing; the vesicular eruption which is frequently present being due to and in proportion with the amount of transpiration, as we know is the case with the sudaminal eruption in typhoid fever. The sweating is generally profuse for several weeks, and may continue in one part of the

body—sometimes a single arm—after it has ceased elsewhere. The phenomenon is explicable on the supposition of those parts being especially infected. The excessive sweating is generally supposed to be due to stimulation of the sudoriparous glands, from the hyperæmia resulting from the entozoa locating within the superficial muscles. The muscular contraction usually shows itself within the second week, and is the most marked symptom for the two or three following weeks. The muscles become swollen, hard, and painful, the patient suffering agony upon pressure or any endeavour being made to extend his limbs. The swelling is centrifugal, commencing at the roots of the members and extending to their extremities. The sense yielded to the touch by the muscles is compared to that furnished by caoutchouc. A tetanic rigidity is frequent in the muscles of the neck, back, and limbs; upon dissection of rabbits, Kestner found the temporal, masseter, and pterygoid muscles those most thoroughly infiltrated. Patients usually lie upon the back, unable to move, during the height of this period, and the agony endured renders sleep either impossible, or at best very much troubled. A peculiarity has been observed in children however, in strong contrast with adult cases, for they generally lie upon their sides, and sleep most of the time. About the third or fourth week, the diaphragm, intercostal, and other muscles of respiration becoming invaded, a greatly impeded action, followed by their partial paralysis, may ensue, ending in death. It is seldom that death occurs from this cause sooner than the fourth or later than the fifth week. In the gravest cases, about the fourth week frequently typhoid symptoms set in; there is in such cases a reaccession of fever, the pulse rises to 112 to 144, the respiration increases to 40 or upward. If constipation has previously existed, it is now succeeded by diarrhœa. The tongue becomes dry. The abdomen is tympanitic, and, in those instances in which a fatal result follows, there is involuntary emission of urine, a feeble, thready, rapid pulse, when finally delirium, carphologia, and hiccough close the scene. In the majority of cases, however, the fifth week marks the beginning of improvement. This may be deemed the—

3. *Third period, or that of convalescence* (*stadium regressionis*, Ruppecht). During this period there is usually a gradual improvement manifest, which is announced by a falling of the pulse and diminished frequency of respiration. When the fever is not diminished in intensity by the fifth week, it is generally because pleurisy or pneumonia sets in to complicate the case. On a subsidence of fever, the sweats diminish, the secretion of urine is increased, and sleep returns, while at the same time the patient can commence moving his limbs. The appetite, however, is usually slow in returning, and the feebleness is very great. It is about this time that we see a new œdema exhibiting itself, quite different from that of the second week, and which usually lasts not longer than from five to eight days. The œdema of this period commences with swelling at

the malleoli, and extends upwards, and not rarely assumes the proportions of general dropsy. The effusion at this stage is the consequence of anæmia, and it has been called by some authors the *period of anasarca or anæmic œdema*. It is during the sixth week that the patients begin to use their members, the extreme sensibility now disappearing. Yet, for some time, walking is described as very painful, from the extreme sensibility of the plantar muscles. During convalescence the hair falls off, as frequently the nails, and sometimes the skin is detached in large flakes.

Since 1860 the interest in the habits and development of the *trichina spiralis*, which up to that time was simply of a scientific nature, as naturally may be supposed, has been greatly intensified by the practical bearing lent to the subject by Zenker's discovery. Among the large number of investigators who have enlisted in the subject may be mentioned Virchow, Leuckart, Küchenmeister, Leisering, Haubner, Kestner, Scoutetten, Turner, Davaine, Tommasi, and especially Pagenstecher and Fuchs.

We would give a *résumé* of their observations by saying: The trichina is from $0^{mm}.15$ to 3 millimetres in length, and $0^{mm}.03$ to $0^{mm}.05$ in thickness.[1] When in the larval or encysted state, it is asexual (Fig. 1), but on being taken into the stomach it undergoes full development, the female (Fig. 3)

Fig. 1.

Fig. 2.

FIG. 1.—A *muscular trichina*, after complete development. M. E. Gros-Renaud. Magnified 320 diameters.

FIG. 2.—An *intestinal trichina*, grown male, with generative organs exhibited at tail. Magnified 150 diameters.

[1] *Vide* Kestner, pp. 22, 23. Pietra Santa, La Trichina Spiralis D'Owen, Paris, 1866, p. 9: gives $0^{mm}.8$ a 1 millimetre. Dalton, Observations on Trichina Spiralis, Transactions N. Y. Acad. of Med., 1864, gives length $\frac{1}{36}$ inch, breadth $\frac{1}{100}$ inch.

being of greater length than the male (Fig. 2), and always being found, in proportion to the latter, in much greater numbers, by some observers it

Fig. 3.

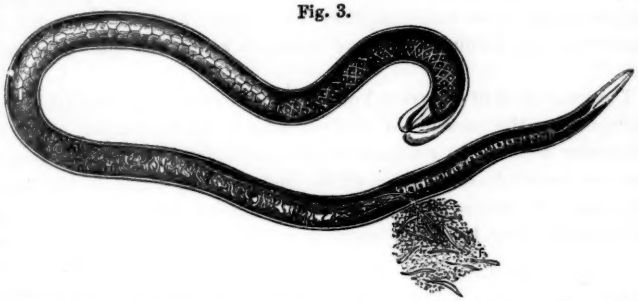

Fig. 3.—An *intestinal trichina*, grown female, full of eggs and embryos, a number of which are seen escaping by the vulvar orifice, situated and opening towards the head of the animal.—KESTNER.

having been seen to be seven or eight times as numerous. Besides an alimentary canal, the female has an additional tube opening towards the mouth, which latter is situated at the most attenuated end of the worm, contrary to what the early observers supposed. This tube is the receptacle for its eggs, which are developed within her previous to extrusion; the animal is consequently viviparous, and produces according to Virchow 200, to Gerlach 400, and according to Leuckart 1,000 embryos. The young thus born, as stated above, are without sex. It would seem that reingestion by the stomach or bowels is necessary to their development, for if they remain in their encysted state, they ultimately perish. Immense numbers of them may be found within a very small space. Dalton observed twelve trichinæ in a piece of muscle the one-twelfth of an inch square and one-fiftieth of an inch thick, which would give 7,200 to the square inch; and we ourselves have, in a piece of muscle weighing one-tenth of a grain, been able to distinctly count 11, giving thus 52,800 to the ounce; a few mouthfuls of food infested at such a rate would afford females enough to generate millions.

The parent trichinæ, after giving birth to their young, are expelled from the intestines. About a week, usually, after trichinous food has been taken into the stomach, the young animals have been hatched, and commence boring into the walls of the intestines, though Fiedler's experiments upon rabbits show that the trichinæ may become sexual during the second or third day, and the embryos quit the mother to commence their peregrinations on the fourth day. They seek the striated muscles as their destination.

A number of observers have supposed that the young worms reached their ultimate habitat by the torrent of the circulation. Dr. Dalton expresses himself as of that opinion, and in some observations was led to conclude that the cysts were formed within the walls of the capillaries.

He thinks the œdema of trichiniasis lends confirmation to his observation, which, he says, "it would be very difficult to explain on any other supposition, but is easily understood by an arrest of the circulation taking place simultaneously in so many capillary bloodvessels as must necessarily be obstructed when 7,000 trichinæ are contained within the space of a cubic inch."[1]

The great mass of observers, however, and Virchow and Leuckart among them, believe the parasite to work its way to its destination purely by vermicular action. In confirmation of their opinion is the fact that we have no recorded observations of the animal being found in the blood. Reaching the muscles, they commence undergoing encapsulation, the capsules having their long axes ranging parallel with the muscular fibrillæ. The attachments of the muscles, where the muscular fibrillæ become converted into tendon, seem to furnish an obstruction to their progress, for it is here that they are found to be encysted in the greatest numbers. As said, the striated muscles—the heart excepted—are their seats of election. They have not been discovered in the brain, liver, kidneys, bladder, or in the fat. Usually but a single worm is contained within a cyst, though occasionally two and sometimes three are found. As time advances, the capsules become thickened and hardened, minute fatty globules are frequently found deposited around the two polar extremities (Fig. 4), and in time the whole cell seems to undergo calcareous degeneration. After encapsulation, the entozoa no longer produce trouble, consequently patients who survive encystment very generally recover. It has been noticed that, after recovery, patients frequently become excessively corpulent.[2] When encysted, the worm remains in its dormant state, or hybernation, so to speak, until the death

Fig. 4.

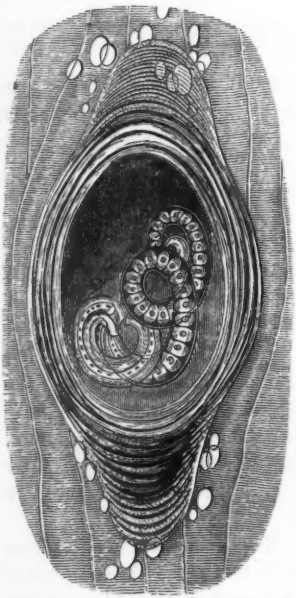

Fig 4.—A cyst, around the poles of which fatty granules have commenced depositing. Photographed by M. E. Gros-Renaud, under the supervision of Kestner. Magnified 300 diameters.

[1] Observations on Trichinæ Spiralis, Trans. N. Y. Acad. Med., p. 15.

[2] Althaus, in speaking of Hilton's subject being cancerous, and Langenbeck and Blasius each operating upon a trichinous subject for cancer, suggests cause and effect as existing between the two affections. We notice another by Von Thaden, and a recent case of cancer in a trichinous patient operated on by Middledorpf.

of its host, when, if chance favours its entrance into the stomach of another animal, it commences anew its cycle of development, otherwise it perishes. Scoutetten gives a case where the muscle of a subject, who had been infected thirteen years previously, promptly developed and gave forth young upon being swallowed by a rabbit; and in the *London Medical Times and Gazette* for June, 1866, is the record of a case from *Virchow's Archives*, in which living trichinæ within calcareous capsules were found in a patient who had been trichinosed twenty-four years previously.

In 1864, Pagenstecher, aided by Fuchs, devoted nine months to experimenting on *Artificial trichinization* upon animals of various classes, viz: Mammifers; birds; cold-blooded animals: amphibia, fishes, mollusks, and even insects.

Among the *Mammifers*, they studied first the domestic, then savage animals, and of the former class, the *dog* was the first subject of observation. They found, as Virchow, that trichinæ within the intestines of the dog would undergo development and propagate, but that they would not penetrate the intestines and enter the muscles. One or two other observers speak of having infected dogs, but the cases were certainly exceptional, and it has been thought that the entozoon producing infection, was of another species than the *trichina spiralis*, as has been found in the case of the mole. The *cat* is easily infected, and the *rabbit* more so. All efforts to trichinize a *he-goat* were unavailing, though he was made to swallow large quantities of the infectious viands during several weeks. The *she-goat* was very difficult to infect, though this could sometimes be done. The *hog*, as before known, he found excessively easily infected. The *calf* was found susceptible of infection. One was experimented upon which was exclusively fed upon milk; it was fed for several days upon rabbit flesh containing, as calculated, about 70,000 trichinæ. It was killed 19 days after, and the intestines were found to contain a great quantity of trichinæ, and a part of them had already commenced their migrations into the muscles. The *bull*, *ox*, and *cow*, were tried, but, although some of the trichinæ were developed and gave forth young, none of them penetrated the muscles. The *sheep* could be trichinosed, though with difficulty.

On experimenting upon *wild animals*, it was found that in the *fox*, a similar result took place to that which happened with a dog—the trichinæ, developing in the intestines, but then dying. The *wild boar* was as easily trichinized as the domesticated porker; *stags*, and *roe-bucks* were susceptible, though the infection was produced with difficulty. *Guinea-pigs*, a few days after ingestion of trichinous food, evinced symptoms of great suffering, and died within eight or nine days. The *hare* seemed a little more difficult to infect than the rabbit. *Mice* died about ten days after ingestion of the food; *rats* resisted infection a little more than mice. As to *badgers* and *martens*, the question remained doubtful.

In *birds*, they never succeeded in the production of muscular trichiniza-

tion, though they experimented with the barn-yard fowls, the *cock*, the *hen*, the *goose*, the *turkey*, and the *pigeon*, besides the carnivorous ones, the *starling*, the *crow*, the *jackdaw*, the *jay*, the *peacock*, and *turkey-buzzard*. The entozoa increased and became sexual, but were expelled by the alvine evacuations; in the *magpies* no trace of intestinal trichinæ could ever be found four days after swallowing the meat.

In *fish*, especially the *carp*, which eat trichinous meat readily, the trichinæ never underwent development. In the *amphibia* the result was the same, the experiments having been made upon *frogs* and many species of *salamanders*. In frogs sometimes the trichinæ had left their cysts, though development was never observed to have proceeded farther. Once in the heat of summer, July 22d, a male trichina was found in the intestine of a *triton*.

Among the *crustaceæ*, the *crab* alone was experimented upon; the result was negative.

Among the the *insects* fed, were *flesh-flies*, and *beetles:* the organs of the former were never found to contain trichinæ, though among the beetles the *Dyticus Marginalis*, five days after eating the food, was found to contain living trichinæ within its stomach.

They give as the result of their conclusions, that of all the animals which come to our table we need fear trichinous infection from the hog alone. Dr. Percy, of New York, has recently given a case occurring under his observations, in which beef had infected a family, and which upon examination was found to have trichinæ in it, though in nothing like such numbers as he had found in pork. Simon cites the cases of two patients who were trichinosed by beef in the epidemic of Calbe; Rupprecht reports two others in the Hettstadt outbreak, and subsequently the falling ill with trichiniasis from eating raw beef, of six persons during the epidemic of Leipsic. These contradictions to the observations of Pagenstecher and Fuchs, as also the experience of Leuckart, who fed 1220 grammes of trichinized pork to a young beef which he killed at the expiration of two months, and could find no trichinæ within the muscles, it has been attempted to remove by saying that the beef had been cut with the butcher's shearing-knife and had laid in contact with trichinized pork in the stall. Dr. Percy was informed by the butcher that the beef in question in his case had been fattened at the distillery stables at Newton, Long Island. Even admitting the possibility of trichinizing beef, doubtless it is so rarely infected, and then through accidental circumstances in the way of unnatural feeding or otherwise, that it need not much be feared. Our real fears should rest with pork, and with this view, attention has been especially directed to the food of the hog, to find out if possible what may have been the original source of infection. Professor Schacht, of Germany, discovered in the beet-root—a regular article of food for swine in that country—what seemed to be trichinæ, a minute kind of worm inclosed in cysts; and hence this was thought at the time

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to be the prime source of infection. Stein subsequently examined with care these supposed trichinæ, and found them to be of an entirely different character from *trichinæ spiralis*, confirming in full an antecedent observation of Virchow, and which received further confirmation by Dr. Kuhne, of Halle.[1] Prof. Langenbeck thought that the earth-worm was naturally infested by trichinæ, asserting that he once found between 500 and 600 in a single annelida. It has been proved, however, that he was in error, and that as in the case of Schacht, the parasite belonged to a species in every respect different from the trichina.[2] The mole, according to Herbst, is more generally found trichinosed than any other animal. Virchow and Leuckart doubt the identity of the entozoon with the *trichina spiralis hominis*.

All experiments upon the encysted muscular trichinæ coincide in demonstrating their extraordinary tenacity of life. Leuckart submitted trichinous flesh for three days to a temperature of thirteen degrees below zero F., after which he fed it to a rabbit, which died trichinosed at the end of four weeks, and it has been ascertained that they will bear, for a time, with impunity, a temperature up to 169° F., but heated above that point they are infallibly destroyed. (Kestner.) Tomassi says that they can be vivified after desiccation. (Pietra Santa.) Hertwig boiled trichinous meat, cut in slices the size of one's thumb, for twenty-two minutes without killing the trichinæ, though a continuation of the boiling three minutes longer destroyed them. Virchow demonstrated the difficulty of destroying them by soaking trichinous meat in a solution of chromic acid so strong as to coagulate the muscular tissue, and yet after eight days of digestion, on denuding them of their capsules, they showed by their movements that they had not been injured. It has been asserted that salting may be relied upon as a destructive means. Accurate investigations demonstrated that the effect of salting is so uncertain that it cannot be relied upon; a person has been infected by pork which had been submitted to a salting of thirty-five days.[3] Smoking is equally doubtful.[4]

With a view to the destruction of trichinæ while in the intestines, a great many experiments have been made upon muscular trichinæ with medicinal substances, and observing their power of resisting the effects of them. The picronitrate of potash, from which so much was expected after Friedrich's cases, has been demonstrated by Fiedler and others to be of no avail. Mosler demonstrated that trichinæ were killed after thirty hours immersion in rectified oil of turpentine.

[1] *Vide* Gazette Hebdomadaire, 9 Mars, 1866.

[2] This discovery was deemed so important, that the Prussian Minister of Agriculture made a request of Dr. Kuhne to examine the question; which he did, and came to the same conclusion as Virchow and Gerstœcher, who placed the parasite in a different class.

[3] Scoutetten.

[4] Gaz. Hebdomadaire, 18 Mai, 1866.

That they could resist pure chloroform about five hours.

They were found by him alive after an immersion of thirty hours in Fowler's solution of arsenic.

They were found living after lying for forty-eight hours in a mixture of two grammes of santonine, and eight grammes, each, of olive and castor oil.

Extract of male fern four grammes, and fifteen grammes, each, of gum arabic and distilled water, did not destroy them in thirty hours.

A strong decoction of pomegranate bark gave the same result.

In iodide of potassium two grammes, and water thirty grammes, they were living at the expiration of thirty hours.

In a solution of carbonate of potassa eight grammes, and distilled water thirty grammes, they ceased to live beyond twenty hours.

Colberg found a concentrated solution of chloride of sodium to kill them within a quarter of an hour; and Rupprecht at the end of two hours; though, as Fritz remarks, how can we deem kitchen salt an antidote, when we have salted meat, and especially ham, so frequently communicating trichiniasis.

The only reliance against infection by trichinized meat seems to be to raise it to a temperature above 170, at which point the albumen in the tissues of the worm will become coagulated, and the parasite thus be certainly destroyed.

It is a little singular that trichiniasis seems to be almost entirely confined to Northern Germany and Prussia. But our wonder ceases when we come to learn of the culinary habits of the population, and we are no longer astonished at such outbreaks as those of Hettstadt and Hedersleben, when we know of the common German custom of eating *rostewürst*, after only twenty-four hours smoking; and when we learn that butchers when cutting up mince-meat are not unaccustomed to eating titbits raw from the block.

The population of the French departments bordering on Germany consume pork derived from the same source as that used by the Germans, but only after being well cooked. Trichiniasis among them is unknown, while with their neighbours it is prevalent. So terrible has the affection become to the German people, that in several of the principalities the sale of pork is illegal, until it has been inspected microscopically, and branded by constituted authority. Recently, the French Government, alarmed by the fearful sufferings experienced in Germany, deputed M. Delpech, of the Academy of Medicine, and M. Reynal, of the Veterinary School at Alfort, to proceed to Germany to study the affection and report upon the propriety of requiring inspections previous to the sale of pork within the French empire. The result of their observations was the opinion that the German people's sufferings were entirely due to the habit of not properly cooking their food, and that as long as the present mode of preparing pork for the table in France should continue, the danger of infection was nil, and that consequently inspections were unnecessary.

As a result of the compulsory inspection of pork in Germany, some knowledge of the proportion of trichinous hogs to those free from infection has been gained, and it has been found to vary very much in different localities, *e. g.*, at Brunswick, according to Otto Muller, since the 1st of Dec. 1863, 19,747 slaughtered hogs have been inspected, with the result of finding but 2 which were trichinized. At Blankenbourg, from 21st of Oct. 1864 to 21st of Oct. 1865, 700 hogs were examined microscopically, 4 being found trichinized. At Zinton, of 45 hogs examined, by M. Risse, 3 were discovered to be trichinized. And at Fulda, 1 hog in 412 contained trichinæ.

The *trichina spiralis* does not seem to be confined to Europe, but observations recently made in Chicago show that some sections of North America would seem to have the swine inhabiting them as frequently infected as any part of Germany. By Scoutetten's account, the entozoon is also found in South America. He relates the case of a ship coming into Hamburg from Valparaiso, Chili, with several sailors sick, two of whom died in hospital with the symptoms of trichiniasis, and the muscles of one of whom were examined, and found infiltrated with living non-encysted trichinæ. Upon tracing the malady to the source of infection, it was found that a hog had been bought at Valparaiso, and subsequently killed aboard ship, and that its flesh, a part fresh and part salted, had been a portion of the sailors diet: upon examining with the microscope a piece of that which had been salted away, it was found infiltrated with trichinæ.

In the United States, thus far, there have been but few cases of trichiniasis recorded. The first, of which we are aware as being diagnosticated as such in this country, were those occurring in the practice of Dr. Schnetter, of New York City, in Feb. 1864, in the case of a German family who had been eating raw ham, which upon a microscopic examination, made subsequently, was found filled with trichinæ, and which resulted in the dangerous infection of the whole family, and the death of one of its members. Dr. Voss, a short time subsequently, was called to see the captain, first mate, and cook of a Bremen ship, then lying ill in the harbor of New York. The symptoms were of an anomalous kind, but such as to induce Dr. Voss to suspect trichinous infection. To satisfy himself, he cut down upon the deltoid muscle of the second mate, and upon removing a portion of its tissue and subjecting it to the microscope, by the calculation of Dr. John C. Dalton, who examined a piece given him by Dr. V., it contained a little over 7000 trichinæ to the cubic inch. Dr. Lothrop, of Buffalo, has also reported a case. Recently in Linn County, Iowa, we have an account of 9 persons in a family eating raw ham, with the serious illness of all of them, and the death of five.[1] The cases thus far recorded in

[1] *Vide* Med. News, and Library, July, 1866.

this country have been nearly all among the foreign population among whom the custom of eating raw meat prevails.

Dr. Leidy says that the inhabitants of the United States appear to be less infested with entozoa than those of any other part of the world, and accounts for it by the fact, that an abundance of wholesome food being at the command of the poorest labourer, there is produced a high organic activity which is unfavourable to parasitic development. He gives the cooking of food, by destroying the germs of parasites, as the reason for man, notwithstanding his liability to the latter, being less infested than most other mammalia; and very pertinently asks: "Did instinct originally lead him to cook his food, to avoid the introduction of parasites?"[1]

Be this as it may, if the promptings of instinct are not sufficiently strong within us, the teachings of science of the last few years ought certainly to lead us in future to eat our pork well cooked.

DANVILLE, KY., August 7, 1866.

ART. IV.—*On Retrogressive Motions in Birds produced by the Application of Cold to the Cervical Spine, with remarks on the use of that Agent as an aid in Physiological Investigations.* By S. WEIR MITCHELL, M. D.

AT long intervals during several years, I have made use of various degrees of cold as means of research in experiments upon the nervous system, and, especially, its central ganglia.

Until recently I have been unable to control it, so as to secure from its employment all the advantages which at one time I was led to look for.

Of late, however, the interesting and valuable method of causing local anæsthesia by cold, invented by Dr. B. W. Richardson, of London, has enabled me so to improve upon the plans which I formerly followed, as to lead, in one direction, at least, to results of the utmost interest, and I believe of entire novelty.

Were my time completely at my own disposal, I should have preferred to wait until I had developed and explained these results more perfectly to my satisfaction. Unfortunately I should have been obliged in this case to await the return of another summer, and I have therefore thought best to lay before my fellow-workers, in this branch of science, the conclusions already attained; trusting to them and to my own future labours to complete what I have in part effected.

Various methods have been made use of to study functions by injuring or destroying the organs to whose integrity they have been supposed to

[1] A Flora and Fauna within Living Animals, Smithsonian Institute, 1851.

owe their existence. For this purpose mutilation or ablation has been employed. In other cases poisons have been given to abolish for a time the action of those portions of the centres or nerves upon which certain drugs have been thought to exert an influence. This latter mode is even more uncertain than the one about to be proposed, and has besides obvious inconveniences upon which it is hardly necessary to dwell.

During the spring and summer of 1863, Dr. Morehouse and I engaged in a prolonged research on the cerebro-spinal fluid, and the influence of pressure in producing convulsions. In the course of these experiments the following observations were made. As I was led by them to engage in the experiments which are the subject of the present paper, I think it best to copy them at length from my note-books. I am the more willing to do so, since they possess an interest in themselves, and are, I believe, rather novel in character.

Experiment 1.—June 6th. Large rabbit, cut down in middle line, and made a minute opening through the membrane which fills up the occipito-atloid space.

A tube twelve inches long, and two millimetres wide, open at both ends, was drawn to a point at one extremity, and expanded funnel like at the other. The lips of the small end were rounded carefully and made to flare outwards a little. This extremity was then slipped through the hole in the membrane which it accurately closed, when drawn gently outwards, so as to bring the flange of the tube against the inside lip of the opening. The tube was then held upright, and water temperature 66° F. was poured into its upper end. It was possible in this manner to pour into the tube, and through it, into the spinal canal, at least *half an ounce* of fluid. At a certain point, usually when there was a pressure of ten inches in the tube, convulsions ensued and checked the experiment.

The injection thus made, displaced the blood in the spinal vessels, and caused bleeding from any exposed veins of the cord or head. Died next day. Medulla oblongata softened.

Expt. 2.—In two rabbits we repeated this observation, injecting water at 100° F., when the largest amount was borne before general convulsions took place.

Water at 120° F. Less pressure was borne and convulsions came sooner. When water at 32° F. was employed we found that the spasms followed almost instantly upon the introduction of the first few drops of fluid.

The convulsions which ensued were very remarkable. The animal rolled, turned, leaped, shivered, and in fact exhibited every variety of convulsive action in remarkable perfection. This effect seemed to be due to the direct influence of cold on the medulla oblongata, since like effects were produced when a morsel of ice was laid gently upon that organ, or when it was exposed and iced water was dropped upon it.

This very striking experiment led me at a subsequent time to test the possibility of suppressing the functions of central ganglia by the use of cold.

It is scarcely necessary to do more than allude to the attempts which I made to effect this end. At intervals, during the summers of 1863 and 1864, I made many applications of ice, and ice and salt in bags, to the spines and brains of rabbits, Guinea-pigs, and kittens. Nearly all of these experiments failed to give striking results. In some cases, as where I tried to freeze the part without removing the overlying tissue, no marked phenomena ensued. In others, where I placed the freezing mixture on the bony spine itself, or on the head, feebleness alone was produced. In no

instance did I make use of birds until the spring of 1866, from which time my present experiments date.

At the period last referred to, it occurred to me to try whether Dr. Richardson's application of the atomizer to local anæsthesia might not enable me to effect the purpose in which I had previously failed. I also reflected that birds might answer better than quadrupeds, on account of the thinness of their skulls, and the comparative isolation of some of the central organs—such as the cerebellum, and the optic tubercles. On the other hand, birds offered an embarrassment in the high temperature which their bodies present, and which, of course, makes it difficult to freeze any portion very deeply. The heat of the pigeon, for example, is frequently nine degrees above that of man.

Notwithstanding this drawback, the change in the animal used, and the employment of Richardson's method enabled me for the first time to get satisfactory results. Among the most striking were those which I obtained while attempting to freeze the necks and heads of pigeons, and it is these which I propose here to relate at length.

The method in this research was much the same in every case, and will exact very little description; Richardson's atomizer was necessary when ether was used. In general, however, rhigolene was employed with the aid of a cross jet of air—such as is made use of in atomizing water. This is mentioned particularly because the form of apparatus which is best for ether does not answer so well with rhigolene.

In some instances the atomized fluid was thrown upon the skin, in others on the bony case of the nerve-centres, and more rarely on the nerve substance previously laid bare, or merely guarded by a thin patch of caoutchouc. The animals employed were pigeons, chickens, rabbits, cats, and frogs.

Expt. 3.—June 29, 1866. I threw a jet of rhigolene upon the back of a pigeon's head. The time not stated in my notes. He shivered towards close of freezing. When released he walked away, shook himself, cleaned his feathers and bill, etc. In one minute he began to move backwards suddenly, as if by his own will. Before each motion of this kind he squatted close to the floor, and as he began to move, threw his tail up and his head down, and to one side. The series of motions had the appearance of a spasm. In the intervals he sought a corner, and sank into a stupid condition, or else walked about as usual until either a backward motion overtook him, or he fell anew into stupor. From this he was easily aroused, and was then to appearance in full possession of all his faculties. The backward movements at length became visible only as sudden checks which overtook the pigeon now and then while walking forwards.

This experiment offered certain novel and curious facts. The delay before any noteworthy phenomena were seen, the sudden onset of a strange form of convulsive movement, the state of partial stupor apt to follow, and finally the healthy appearance of the animal in the interval, reminded me of the symptoms of certain epileptic cases, and made me hasten to repeat the observation.

Expt. 4.—Same pigeon frozen two minutes a little lower down, so as to more exactly influence the cerebellum. Released, he walked away well and strong,

pluming himself, and picking his breast, a common motion. Within twenty seconds the first backward motion took place; at the same time an increasing difficulty of movement overtook him. He walked as if drunk, lifting his legs very high, in a curious fashion. Five minutes from the freezing he still had frequent backward motions, which gradually lessened. At the tenth minute he began to exhibit the attacks of stupor.

Expt. 5.—Used rhigolene over the cerebellum of a young pigeon for about four minutes. Released, he could not stand, but rocked to and fro, and threw himself from side to side with general movement of all the muscles, but no orderly execution of any series of movements. Second minute, ran forward naturally for the first time; tried to fly through the window, and uttered the cry common to young pigeons. At the third minute he began to turn somersaults backwards, and did so for half a minute, when he stopped a moment, and again continued to turn over backwards. Then came a period of stupor, broken at the fifth minute by continuous backward turns. He still cried at intervals, and the somersaults gave place to backward movements which were very rare, when, at the ninth minute I ceased to observe the bird. Three days later the pigeon was perfectly well, except that he had a small slough over the most prominent point at the back of the skull.

Up to this time I had seen nothing very novel, excepting the temporary creation of spasms, such as in some shape were known to occur when the cerebellum was mechanically injured. The following experiment opened a newer field:—

Expt. 6.—A pigeon whose cerebellum had been previously frozen many times was chilled on both sides of *the neck* during one minute by a double jet of rhigolene, at the level of the tenth cervical vertebra, just above the junction of the neck of the body. When released, he became at once the sport of violent general convulsions. They were very complete, and offered no other striking character for a few moments; then there were occasional backward somersaults, or an effort in this direction. At the second minute the backward walking motion began to be seen, as the general spasms and the somersaults ceased. The stupors also appeared, and alternated with the runnings backward until within an hour the animal gradually recovered its usual health.

If the results above noted had followed the chilling of the cerebellum only, I should have been little surprised; but nothing in our previous knowledge of physiology led me to look for general convulsions or backward spasms from injury to the spine below the medulla oblongata. After witnessing this remarkable result I repeated the experiment again and again upon a number of pigeons, with precisely the same results, sometimes obtaining backward somersaults, and at others only retrograde movements, alternating with periods of stupor and intervals of apparently full control of all the normal movements.

At another part of this essay I shall describe more minutely the character of these abnormal motions. At present I pass on to consider the limits of the region which, being chilled, will give rise to them. I began at the cerebrum and made the following experiments, which I briefly state:—

Expt. 7.—Pigeon previously frozen several times, but now perfectly well. Rhigolene spray on skull over cerebrum for four minutes, guarding the cerebellum with a card, and also preventing, in a similar way, all inhalations of the vapour, a precaution which was taken whenever the freezing was near to the head. Released at 6.44½. His head rolled about a little. His general movements

were uncertain, and he walked away, seeking a corner. One and a half minutes. Continuous backward somersaults, with short intervals of rest and stupor. Sixth minute. Same phenomena. Observation ceased.

Expt. 8.—Rhigolene on cerebral region three minutes. Pigeon in a state of profound sleep or stupor. Third minute after freezing, head falls, eyes closed, weak, falls sideways, but soon tries to walk, and seeks a corner. Fourth minute, stupor, roused by falling over. Occasional spells of like nature, but less marked, and further apart. No backward movements at any time.

Expt. 9.—Exposed cerebral lobes of pigeon; no bleeding; drew skin together over the brain, and threw rhigolene jet on it for one minute, freezing it as hard as ice. Set free, he flew straight up into the air one or two feet, again and again for three minutes; then had spells of vehement forward movement, during which he stumbled, with his neck bent forward, eyes shut, not directing his steps, and running against any obstacle put in his way. In four minutes he became more conscious, tried to fly out of window, and suddenly fell into stupor, from which a push aroused him. Eighth minute. Backward walking spasms for eight or ten steps at a time, varied with stupor. Nearly well at twelfth minute.

Expt. 10.—After an hour froze the exposed cerebrum of same pigeon one and three-quarter minutes. Asleep; awakened somewhat in ten seconds, and had slight general convulsions. First minute, intense forward flexion of neck. Attempting to move forward he falls on his side; alternate sudden forward rushing motions and backward walkings, the latter predominating. Fifth minute. Backward motions only, but well marked. Recovery at seventh minute.

In these and similar experiments I sometimes succeeded in abolishing for a few moments the cerebral functions, and causing deep sleep. In one case the freezing went so deep as to influence the region of the corpora striata, occasioning the violent forward movements which Magendie originated by ablating these parts.

Besides these phenomena, backward motions were sometimes observed, but they were never so violent as when the cerebellum or spine was directly attacked.

Since it is practically very difficult to limit the freezing so as to be sure when you freeze the cerebrum that you do not also chill the cerebellum, I am inclined to suppose that the backward motions which occur when we are acting on the former organ may really be due to an affection of the latter; at all events, it is well to remember that in the experiments here related, and in other like attempts to freeze the cerebrum, I have but once seen the backward somersaults, which are the most remarkable exhibitions of this form of compulsory activity. There is, therefore, some reason to suppose that the cerebrum is not the centre from which proceed these singular impulses.

It was next desirable to know what parts of the spinal column, upon being frozen or chilled, may give occasion to the phenomena in question.

I began by throwing rhigolene upon the skin over the medulla oblongata. The principal symptoms were great weakness, with confused movements of the wings and legs, feeble and laborious breathing, and, after a few minutes, backward walking, with rare attacks of stupor. As the part lay deep, it was difficult to avoid chilling the cerebellum. The following experiment may serve as a type of the larger number, which it is needless to report:—

Expt. 11.—Rhigolene on skin over medulla oblongata for two minutes, the skin being drawn tightly over the spine, and the head bent forward. Released, very weak, tendency to fall to left side, shivering, feathers ruffled; on walking forward tends to fall on his bill. Third minute. Begins to show backward motions. Fourth minute. Repeated backward movements. Seventh minute. Increased feebleness, backward spells, gradual recovery, with rare fits of stupor.

In the next experiment I laid bare the bony spine just below the medulla oblongata, and threw on it a jet of rhigolene, during three minutes. Released, lies on side, breathing feebly, unable to move, pupils sensitive, reflex motions in both legs on pinching one of them. Second minute. Put on his feet, rocks to and fro, breathing more laboured; gradual improvement, with fits of deep stupor. Twelfth minute. Backward movements alternately with stupors; slow recovery.

Expt. 12.—Rhigolene on neck, half an inch below medulla oblongata at third or fourth cervical vertebra three minutes. Backward spells at third minute, with incessant somersaults; previously ran about as if well; stupor; tried to enter his cage; plumed himself. Fifth minute. Somersaults ceased, and are replaced by backward walking, varied with stupors. Recovered.

Expt. 13.—The skin in this pigeon was drawn tightly over the spine, and a double jet of rhigolene thrown on the tenth vertebra for two and a half minutes. Released, he ran about, apparently well. Twenty-fifth second. Marked backward spells, which were incessant until the fourth minute, when he had stupor, followed by confused general convulsions and backward walking. Fifth minute. Backward somersaults, etc. Recovery.

The spine was next acted on at the third cervical vertebra, with the same phenomena. In a second experiment at this same point a double jet was used. The feebleness and disorder of respiration were more marked, the stupors and movements were as before. Recovery perfect in both cases.

The next experiments were made at points between the middle neck and the first fixed vertebra, which itself lies a little back of the upper line of the scapula. In every case I obtained the usual series of backward movements, stupors, and intervals of perfect control. I find that no somersaults are noted in connection with these records, but as they occurred when the spine was chilled below this point, the exception becomes unimportant.

The upper interscapular line is marked by a prominent vertebra, just below which lies the first fixed portion of the spine. In a well-grown pigeon it is at least three and a half inches below the lower level of the skull. Beneath this point the backward spells can no longer be obtained by any extent or depth of freezing.

The following notes relate one out of many experiments in which the jets of rhigolene were thrown exactly between the shoulders:—

Expt. 14.—Rhigolene jet four minutes on first fixed vertebra, at upper level of interscapular space. Released, he ran about, and in fifteen or twenty seconds sank down, shivered, and ran backwards repeatedly; during the quiet intervals he attacked another pigeon. He was next seized with stupor, then another series of backward spells, and again stupor, after which he once more assaulted the other pigeon. Recovered.

In other experiments I guarded the spine with my fingers above and

below the frozen part, but still obtained, in nearly every case, the retrograde motions and the stupors.

Expt. 15.—Froze skin with rhigolene jet one-half inch below prominent interscapular vertebra, at level of second dorsal vertebra, for four minutes. Released, he walked away briskly; in half a minute crouched, showed signs of weakness; has spells of stupor, which come on gradually, so that if he is on a perch he falls off, and is aroused by falling; well in the intervals, except that he seems weaker than common. Observed one hour, when he was well, having no longer any backward spells,

Expt. 16.—Rhigolene jet four minutes on spine, half inch below first fixed vertebra. Ran about as usual; appeared agitated and restless, and weak in his legs; no backward spasms, no notable stupor.

Expt. 17.—I next threw rhigolene jet on the spine, one inch above the line of the great trochanters of the femur, a point easily found. It is at the upper level of the sacrum. Froze during four minutes. Released, he ran about clumsily, tripping, intertangling his legs as he moved, and using his wings to aid progression. The movements were so futile and irregular that they presented much the same appearance as when the cerebellum has been frozen deeply or removed by the knife; no stupor, but occasional tendency to rest quiet in a corner; no backward impulsion. Recovery.

Expt. 18.—Rhigolene jet thrown for four minutes on spine, *half* an inch above line of trochanters. Clumsy motions, great feebleness of limbs, walks crouching, now and then falling on his side. One and a half minutes. Sank to rest in a corner, shivering; tremor of legs, especially the left leg; no backward motions or stupors. Recovered.

Expt. 19.—Rhigolene jet on spine four minutes, at the last dorsal and first lumbar vertebra, over the place at which the nerves of the legs make exit. Sudden and violent tetanic spasms of both legs and the tail, during which he fluttered about with the aid of his wings. At the third minute the spasm relaxed, and in four and a half minutes he could walk; he remained feeble for a time, but in an hour was as well as usual.

It results from these experiments and others that at or about the fourteenth vertebra counting from above downwards, we cease to notice the backward spasms and stupors, and see only signs of weakness or of tetanic rigidity in the legs; usually these phenomena come on some time after the freezing, and reach a maximum within ten minutes.

It appears thus far that in pigeons the application of cold to the cervical spine occasions, after a brief period, peculiar backward movements, resembling those which have been previously produced by mechanical injury of the cerebellum. These abnormal actions are, in extreme cases, backward somersaults, followed by spells of backward walking, and accompanied with spasmodic movements of the head, to be fully described hereafter. In milder cases only the backward walking occurs. Both of these forms of constrained movement are met with when the cerebellum has been chilled. A further series of experiments determined that it is immaterial whether the spine be acted on behind, at the side, or in front. In fact, this organ in the pigeon is so small in diameter, and the freezing so difficult to limit, that we might naturally look for the spasms to follow an application of cold to any side of the spine.

It is indifferent whether we freeze through the skin drawn tightly over

he bone, or act on the bare nerve-tissue itself. The following is an example of the latter mode of affecting the nerve-centres :—

Expt. 20.—Exposed spinal cord of pigeon at fifth cervical vertebra, without hemorrhage of any moment, covered it with a small piece of glazed paper, and threw on this pulverized rhigolene jet for twenty seconds. Released, the bird lay twenty-five seconds breathing heavily, as if about to die, and was then suddenly seized with violent backward somersaults, which were continuous during one minute. They were followed by and finally alternated with fits of stupor, the whole ending in backward walkings. Recovery.

I was now interested to know whether the same results could be obtained by chilling the spine of other birds. For this purpose I selected the chicken, making the following very remarkable observations.

Expt. 21.—Exposed bony spine of a large chicken-cock, and for five minutes threw jet of rhigolene upon it, at a point about three inches below occiput. Released, he walked away without any signs of stupor or sickness. In a minute he stood still, looking about him as if confused. At the second minute he began to move backwards, rotating to the left, with long, slow, and strangely deliberate steps. The rotation seemed to be due to a feebleness of the left leg. He moved in a circle of about two feet in diameter, and now and then leaped up in the air abruptly. His head was not thrown down as was always the case in pigeons, and the action had none of the appearance of spasm which it presented in that bird. After five minutes continuance of this most extraordinary motion, his steps became more awkward and irregular, as well as more rapid and spasmodic, but he now ceased to move in a circle.

At the seventh minute came the first pause, and his attacks were henceforward separated by intervals, during which he walked as usual. As the spasm came on, he slowly stooped, drooping his tail feathers, and raising his head. He seemed to have difficulty in extending his toes, which doubled under him as he stepped, and increased the awkwardness of his gait. After twenty minutes his spasms ceased.

Repetitions of this experiment gave like results, and in one case the backward movements were produced by the application of the rhigolene jet during only thirty seconds.

I have totally failed to produce these curious fits in the rabbit, the only mammal upon which I have as yet experimented.

The following analysis of observations on rabbits exhibits my results in this direction :—

Expt. 22.—Froze the bared occiput of young rabbit two and a quarter minutes. The only symptoms were feebleness, and signs of pain, such as squealing, etc.

Expt. 23.—Froze same point four and a half minutes. Fell on side; kicked a good deal; apparent temporary want of power to co-ordinate his muscles; walked freely after a few minutes.

Expt. 24.—Froze rabbit on spine five and a half minutes, an inch below occiput. Released, he lay kicking violently half a minute, then rose to his feet, and fell, kicking again. Finally, he rose and fell several times without kicking, and, at length, was able to walk freely. Recovered in half an hour.

In all the other cases, four in number, I observed disordered movements, and, at the close, great weakness only.

The failure to produce in rabbits the results so readily obtained in birds appeared to indicate some previously unsuspected differences in the nervous

systems of these two classes of animals, and made me desirous to see whether I should succeed any better with cold-blooded batrachians. I therefore made a number of experiments upon frogs, but without the satisfactory results I had hoped for. When the rhigolene jet is thrown upon the region of the brain, the functions of this organ are abolished for a time, and the frog exhibits the phenomena which are common to this animal when decapitated. A jet cast on the spine occasions spasmodic movements of the legs, and, at intervals, violent tetanic contractions. After a few minutes the frog is able to crawl, but does not recover the power to leap, its usual mode of locomotion, until a longer time has elapsed. Recovery is always perfect, and there are no backward movements.

When the jet is thrown on the back of the prominent eyeball, the posterior tissues of the eye are frozen without the cornea having become dim, and in this case very perfect temporary cataract is produced.

The real seat of the backward impulses in birds would seem to be at any point from the lowest cervical vertebra up to the cerebrum, whose power to originate them is at the least doubtful. Two facts, or sets of facts, led me to think it possible that it was in every case the cerebellum or the medulla oblongata, which was the organ finally responsible for the production of the spasms of retrograde motion, which we have been considering.

The first of these facts is the well-known and valuable discovery of Brown-Séquard, that in Guinea-pigs mechanical injury of certain regions of the spinal cord, from the seventh dorsal to the third lumbar vertebra, subjected the animal to fits of an epileptiform nature, which might be induced by various means, or might arise spontaneously. Moreover, these spasms began about the face, so that the spinal wound (partial section) must have produced an over-excitable condition of the nerve-centres above the point of injury.

In my pigeons, likewise, the spasms began with a flexing of the neck, etc., so that it is altogether possible that in these animals also the spinal irritation may act by causing an undue excitability of organs within the skull.

Before continuing, it may be as well to state that I do not recognize any other relation than I have here pointed out between Dr. Brown-Séquard's very brilliant discovery and that which I am now setting forth. The fits he caused came on after some weeks had elapsed; they were seen in Guinea pigs; they were due to mechanical injury to the dorsal or lumbar spine only, and were finally epileptiform, in all of which respects they differed from the novel facts I have observed.

The second set of facts, above alluded to, has also made me hesitate in assigning to the point of the spine injured by cold, the entire responsibility of producing the retrograde spasms.

Magendie pointed out what many other physiologists have since seen, that certain deep injuries of the cerebellum, especially in birds, gave rise to

backward somersaults and movements, which were very violent, and were sometimes continuous for days, or were interrupted only for a few moments when exhaustion was complete.

The spasms caused by cold applied to the spine were also of this retrograde nature, and I was therefore furnished with an additional motive for suspecting that they might really be due to a reflex affection of the cerebellum.

To determine the relation between backward spasms originating in mechanical injury of the cerebellum, and those due to chilling of the spine, I made a large number of experiments and observations. And first, it is to be observed, that when we chill the cerebellum, we cause convulsive movements which cannot be distinguished from those which occur when we chill the cervical spine. Either the whole of these fits then are referable to one single organ, the cerebellum, or else there is in the pigeon an extensive region, at least four inches long, and stretching from the cerebral mass to the first dorsal vertebra, any portion or section of which is capable of developing the retrograde convulsive motions when treated as I have described.

Backward somersaults and enforced backward walking from mechanical injury to the cerebellum, differ very remarkably from those produced by cold. The wound of the cerebellum must be deep to give the proper effect. The result is violent tumbling backwards, or sideways and back, with little or no respite, and certainly with no intervals of healthy activity. The spasms from cold, though often as violent, do not endure so long. They end in backward walking, and this in perfect health. I have caused them by the application of cold to the spine twenty times in one pigeon, within a few days, and still he not only survived, but ate, drank, and moved with usual vigour. Besides this, the spasms from cold alternate with attacks of stupor, in which the head falls, the eyes are shut or open, and the pigeon seems to be in a kind of lethargy. When in this state it may often be handled, or laid on its back or side, without an effort at resistance, while at any moment a loud sound or a sudden motion will break the spell, and it will abruptly run backwards several feet. It was very remarkable to observe the mode in which the stupor came on. If the pigeon was on a perch or window-ledge, its head gradually fell, the body swayed backwards, and at last the feet unclasped, and the bird fell on the floor.

In the chicken the stupor was sometimes so deep that it could be held passively suspended by one foot or a wing.

The intervals of healthy activity between the times of stupor present no marked phenomena to distinguish them from the common state of the pigeon.

There are some other differences between the spasms from chilling the spine or cerebellum, and those from wounding the latter organ. In cerebellar injury the head is carried well back and high up. During the somer-

saults it is drawn further and further back, until the bird rolls head over tail.

In the spasms from chilled spine or cerebellum, the head is carried at ease during the intervals between the fits; but at the moment of attack the bill strikes the floor quickly, first on one and then on the other side, the head being drawn violently forwards. Even in the most terrible of the somersaults caused by cold, the head was drawn forwards, and the backward turn was produced by the action of the muscles of the legs and wings, rather than by those of the back, neck, and spine.

It remained to determine if, when the cerebellum was severely injured, or ablated, I could still obtain the typical backward spasms on freezing the spine.

I found that when the cerebellum was partially injured, so as to occasion turning, or backward somersaults, that an after application of cold to the spine, would introduce into the convulsions rare attacks of the peculiar form of retro-spasm, which were characteristic; that is to say, the pigeon would retreat, with first a spasmodic flexion of the head and neck.

When I ablated the cerebellum, so as to produce utter want of co-ordination, I always failed to secure the display of any backward motion, upon afterwards chilling the spine. To settle this question more thoroughly, it will be necessary to ablate the cerebellum, and keep the pigeon until it recovers the power to control its movements, as does sometimes happen.

If then it should continue to have retro-spasms upon freezing the cervical spine, we might reasonably conclude that these spasms do not exact the interference of the cerebellum—a question which, after all, I should not have thought it necessary to raise, if the peculiar retrogressive nature of the fits had not pointed to this organ, for, up to this time, as I have stated, no other has been known to possess the power to originate this special form of convulsive action.[1]

At present, therefore, I cannot attribute the spasms from cold to the spine alone; and, indeed, I feel strongly inclined to regard this organ as merely the point of departure of a morbid excitation which is finally translated, so to speak, by the cerebellum, into a language of its own, and thus occasions a peculiar form of compulsory movement.

While considering, in this connection, the whole train of symptoms which follows the use of cold on the spine, there is still left for consideration the state of stupor to which the animal becomes liable when so treated.

This symptom is often slight in character, but is sometimes so well

[1] Elsewhere I have mentioned the medulla oblongata as having been supposed capable, when injured, of causing retro-pulsion. There is, however, some doubt on this point; but, at all events, my reasoning would apply to any organ in the head which might be presumed to have this property.

marked that it resembles the deepest sleep, and even approaches the condition of coma. It then becomes plain that this is a state of system in which the cerebrum is affected, and for a time loses its functional activity. Of this there can be no possible doubt. As it was suggested, however, that the stupor might be due to the general depression of temperature caused by the freezing, I made numerous experiments to settle the question thus raised. For this purpose, I chilled or froze muscular and other parts for five minutes at a time, but without obtaining stupor or spasms. Moreover, I found that both symptoms often continued unaltered, when the pigeon had regained its normal standard of temperature.

If, therefore, chilling the spine determines a marked *cerebral* disturbance, there is no reason why we might not assume, with logical propriety, that the *cerebellum* may be ultimately responsible for the backward spasms. Without being at all sure of this, I beg leave to offer the above considerations as casting some light on a point which I still regard as most obscure.

In dealing with this subject, I have neglected to consider the possible share which the medulla oblongata may have in causing backward movements. Magendie considered that both this organ and the cerebellum were the seats of a normal forward impulsion. The corpora striata were, as he conceived, the centres of an opposite tendency, so that, when the two former organs were wounded, the balance was destroyed, and retrogression took place.

Apart from his theory—from which most recent biologists, excepting Vulpian, have totally dissented—it is enough to know that the medulla oblongata may give occasion to these motions, so that it is not impossible that the backward spasms which follow chilling of the spine may be finally referable either to this centre, or to the cerebellum, or to both.

I have never caused such movements by injuring the medulla oblongata, and the passage in which Magendie states the fact is a very brief one.[1] If, however, he be correct, and if chilling the spine can cause backward spasms by an indirect influence on higher nerve-centres, whatever I may have said in regard to the cerebellum is equally applicable to the medulla oblongata, or to any part whose direct lesion is known to produce retrograde spasms.

We have still to study the nature of the injury done to the spine or brain by cold applied through the skin or directly.

It was seen throughout my experiments, which have reached to ninety in number, that in almost every case an appreciable interval—and often a long one—existed between the close of the freezing and the access of the spasms. This period varied from a few seconds to twelve minutes. If there was any primary effect, it was merely feebleness, or disorder of movement. When I noticed these facts, I suspected at once that what is seen

[1] Précis de Phys. Magendie, ed. 1836, p. 409.

on the skin after freezing, repeats itself in the nerve substance. First, there is chilling and contraction of bloodvessels, and then actual freezing, which is rarely very deep. Indeed, I have found it most difficult to freeze the pigeon's entire breadth of spine. When this does occur in the upper cervical region, death by apnœa follows at once.

The freezing being over, the part thaws, and long-continued, intense congestion ensues, as any one may observe who will try the effect of the ether or rhigolene douche on his own skin.

It only remained to see if this congestion actually took place in the nerve-substance, as I suspected it must do.

To determine this point, I laid bare the cerebrum of a large pigeon, and carefully noted the colour of the tissue, and the number and position of the chief vessels of the meninges. The jet of rhigolene was then used directly on the part. The visible vessels were instantly frozen, with their contents. As the part thawed, it became intensely congested, the brain darkening distinctly, and the vessels of its transparent coverings increasing in size and number, so that those which could before be seen were larger, and new ones, previously unseen, came into view.

This experiment was repeated several times, with no essentially different result.

In the last mentioned experiment I had preserved the cerebral meninges intact. On a second pigeon I repeated the observation, removing the membranes with great care. I found that several large vessels penetrating the brain from below, came to the surface, and were for the most part torn asunder in displacing the membranes. I chilled the bare cerebrum, covered with thin caoutchouc for half a minute. As it thawed, an intense congestion appeared, with numerous points of much deeper colour. This condition increased during several minutes, but caused no notable disturbance of function.

In the spine of the pigeon I have thought I could see a deepened colour after freezing, but of this I am not sure, owing to the small size of the cord. When, as I shall presently show, we act on this part by other irritants than cold, the resultant congestion is no longer doubtful.

The singular convulsions and stupors which I have described are therefore due, as I think, to the palsy of the vessels which have been chilled by the cold, and which may or may not have undergone previous extreme contraction. The congestion from cold, whether in the nerve tissue or the skin, is most intense at a certain time after the part has thawed, and it is then in the centres that the excitation becomes such as to determine a convulsive attack. These facts naturally incline me to regard the congestion as the essential parent of the nerve changes, which finally result in the spasm and stupor. We should not lose sight, however, of the possibility of the nerve-substance being itself directly altered by the intense cold to which it is subjected. While, therefore, I consider the congestion

which does certainly occur as competent in the case, it is well to remember that the nerve-cells may be most seriously affected during the physical changes of condition, which great alternations of temperature occasion.

My success in causing spasms and other phenomena by the aid of cold, at once led me to anticipate the most interesting results from this method of research, for, if it were now in our power to create in a nerve-centre such a congestion as should allow us to study its effects, and if passing away it should leave the animal in a state of health such as beforehand no one could have looked for, I could not but hope that most important results in the study of pathology might thus come within our reach.

Since, however, it was very difficult to limit perfectly the influence of cold, I endeavored to see if, by other means, I could reproduce the phenomena which cold had enabled me to discover. The production of the backward spells was a very good test. If they were due to congestion, irritants, such as heat and acids, alcohol, etc., should also occasion them by causing an increased flow of blood to the spine. Besides, the local congestion thus created would be manageable, and enable me further to control the phenomena for purposes of study.

After numerous experiments I succeeded in attaining the desired end, and in causing by irritants spinal congestion and backward spasms; that is to say, the same train of symptoms which succeeded the use of cold.

Expt. 25.—The spinal cord was exposed in a pigeon's neck, and water, at a temperature of 165° F. was thrown on it gently from a syringe; about three ounces were used. Released, it walked away and showed no notable immediate result. After half an hour, I repeated the observation twice, using again water, temperature 165° F., and lastly, temperature 190° F. The use of the fluid in fine stream may have lowered the temperature a little, but it certainly coagulated the flowing blood and the bared muscular tissue. Yet to my great surprise the only immediate symptom was a little weakness. The pigeon was observed for an hour, and again three hours later, but exhibited no enforced motions. It was found dead the next morning.

Expt. 26.—I dropped strong ammonia on the bare cervical cord of a pigeon. It seemed to cause pain. The bird moved about restlessly, and at last fell with enfeebled respiration, which became rapidly worse, destroying life in a few minutes after the application to the spine.

In this case, the irritant was too strong, and acted as a caustic. The effect of the heat (Expt. 25) I cannot explain, and will only observe that the observation was incomplete, as the pigeon was not watched constantly after the operation.

In the next observation I made use of tincture of capsicum as the irritant.

Expt. 27.—The cervical spine was bared at the fourth cervical vertebra, and treated with six or eight drops of tincture of capsicum. I observed no results during two hours observation of the bird, except feebleness and uncertainty of gait. I had cut the posterior spinal vein in my dissection, and I was not sure how much of the symptoms might be due to loss of blood. The following afternoon, twenty-five hours later I re-examined the pigeon. To my great satisfaction, it had marked attacks of backward motion, but no somersaults. It died forty-eight hours after the operation.

Expt. 28.—Exposed cervical cord, at the fifth vertebra; dropped on it six drops of tincture of capsicum. As the capsicum was applied the long posterior vein of the cord, which I had exposed, but not cut, was seen to dilate suddenly

as though forcibly filled or paralyzed, and the cord visibly darkened, while a sudden hemorrhage disclosed itself on the edges of the incision. When set free, the pigeon was very unsteady, and rolled about on its feet as it walked; I then washed away the tincture with a little water and the aid of a pipette.

At the third minute, distinct backward movements were seen, with the usual dipping of the beak. At this time the spinal substance was intensely congested, but no distinct vessels could be seen. The backward movements occurred at intervals up to the seventh minute, when stupor took place. After this time the spasms took place mostly when the bird was roused from the stupor. This latter condition was not so profound as after the chilling, but lasted longer. After an hour and seventeen minutes he still had very violent backward motions which continued for ten seconds or more at a time, when the stupor returning, interrupted them.

Twenty-four hours later, this bird was well to appearance, ate and drank as usual. The backward movements still continued, but ceased within thirty-six hours. At the end of a week the pigeon was well and active. It died five weeks later; but through an accident; no post-mortem examination could be made.

It thus appears that the backward movements may be excited by agents, which, like tr. capsici, irritate, congest, and perhaps, by virtue of the alcohol, chemically alter the spinal tissue. It is notable also that, as in spasms from cold, so in those caused by an irritant, the attacks appear only after an interval has elapsed, and are therefore not due to primary alterative influences, chemical or other.

I believe that I have made clear, in the foregoing paper, the following points: That cold may be made valuable as a means of studying the functions of nerves and nerve-centres; first, by chilling the organ down to the temperature, as yet undetermined, at which its functions cease. Secondly, by the congestion which follows, and which enables us to imitate at will a pathological condition, and thus to forward the synthetic study of neural disease.

With the aid of cold, and of the irritants which its use suggested, I have occasioned in birds (pigeons and chickens), a peculiar form of spasmodic or enforced movements, consisting in somersaults and sudden backward walking, such as have not been previously observed by physiologists, except when the cerebellum was mechanically injured.

I may be permitted to state, in concluding, that I regard as incomplete the research which I have described. Even the primary questions in connection with it are not all answered to my satisfaction, while so large a number of secondary points of interest have presented themselves as to make it quite unlikely that I should find time just now, among more pressing occupations, to give them the attention they will receive, I trust, from others than myself. Some, at least, of these investigations I hope myself to undertake at a future period.

In the present series of experiments I have been aided throughout by my friend Dr. Wm. W. Keen, to whom I am much obliged for many valuable suggestions.

ART. V.—*On the Detection and Measurement of Astigmatism.* By JOHN GREEN, M. D., of St. Louis, Mo. (With five wood-cuts.)

ASTIGMATISM (from α privative, and στίγμα, a point), a name proposed by Dr. Whewell to designate the visual defect dependent on a difference in the refractive power of the eye in different meridians, has been long recognized as an occasional cause of imperfect vision. The conclusive demonstrations of Dr. Young (*Philosophical Transactions*, 1801) and of Mr. Airy (*Transactions of the Cambridge Philosophical Society*, 1827 and 1849) completed the history of astigmatism as a mathematical problem, and discovered the optical means necessary for its correction; but it is to Donders, pursuing the line of ophthalmometrical research opened by Kramer and Helmholz, that we are indebted for the demonstration of its anatomical characters and the importance of its pathological relations. Far from being a rare or exceptional phenomenon, Donders has shown that astigmatism exists in an appreciable degree in almost every eye, and in its lower grades must be accepted as a normal condition, while in its higher or pathological degrees ($\frac{1}{4}\frac{1}{0}$ or upwards) he has detected one of the most frequent and important of the refractive anomalies to which the eye is subject. Astigmatism may occur either alone or in connection with any of the refractive or accommodative anomalies; it may exist in one eye only, or in both eyes; and it may be symmetrical or unsymmetrical, equal or unequal, in the two eyes.

The different relations which astigmatism may bear to the refractive condition of the eye have been expressed by Donders in the form of several useful symbols, which are now very generally adopted, for the sake of brevity and precision. Astigmatism is expressed by As. Positive or myopic astigmatism in one meridian only, the other meridian being emmetropic, is Am. Negative or hypermetropic astigmatism in one meridian is Ah. Positive astigmatism in one meridian, combined with negative astigmatism in the other meridian, is written Ahm or Amh, according as the hypermetropic or myopic element predominates. Positive astigmatism in both meridians may be considered as myopia combined with myopic astigmatism, and is written M+Am. So, also, negative astigmatism in both meridians is expressed by H+Ah.

These distinctions are important, and help to explain why astigmatism has so long escaped detection as a common visual defect. Thus Am, which is a partial myopia, is felt as a material disturbing influence in distant vision, but is generally mistaken for simple myopia. Ah and H+Ah, although impairing the distinctness of vision, may be so masked by strong accommodative efforts as to escape detection by any of the ordinary test-objects, and the same is true of Am and M+Am when modified, as is too often the case, by the injudicious use of concave glasses. In Ah

or H+Ah the eye is in a state of continually varying accommodative tension, as well in viewing distant as near objects, and is therefore, I believe, especially liable to asthenopia from weariness of the accommodative organs. In Am or M+Am the same unrest of the accommodative organs may render reading or other fine work excessively fatiguing; while, for distant vision, the conversion of Am into Ah, by concave glasses, secures only a partial improvement in the distinctness of objects, at the cost of incessant accommodative effort. Thus, the adoption of concave glasses in Am, and still more in M+Am, is often attended with such a marked degree of asthenopia as to lead to their speedy abandonment; but when this does not occur, or when the asthenopia has been overcome by persistent use of the glasses, it is soon discovered that, after all, the improvement in vision is less than it at first appeared to be, and farther aid is sought in a stronger pair. Meanwhile, the habit of completely relaxing the accommodation in distant vision is neglected, and the apparent myopia from this cause seems to confirm the indication for the adoption of stronger glasses, and thus actual myopia is artificially induced, or, if already existing, is needlessly aggravated.[1]

The disturbing influence of the negative forms of astigmatism, Ah and H+Ah, is generally first noticed after the accommodative function has lost the extreme range which belongs to it in the earlier years of childhood. These disturbances are first detected in near vision, as in reading, and may take the form either of asthenopia, or of premature presbyopia, which is often mistaken for amblyopia. In such cases the adoption of proper convex glasses will restore to the eye whatever visual acuteness it may have originally possessed; but the full visual improvement of which the eye is capable, and especially the absolute repose which is so necessary to the asthenopic eye, can only be obtained by the use of cylindrical glasses, combined, if necessary, with spherical surfaces suited to any existing degree of ametropia or presbyopia.

The characteristic effects of astigmatism in modifying the distinctness of retinal images, may be very simply demonstrated by means of a convex spherico-cylindrical lens, made by combining a plano or double convex lens with a

[1] That this danger of induced myopia from the injudicious use of concave glasses by astigmatic persons is a real one, I infer from the very large proportion of myopes wearing glasses, who, upon proper examination, prove to be astigmatic in a very marked degree ($\frac{1}{10}$ or upwards). This would almost appear, from my own observation, to be the rule rather than the exception, and I cannot resist the conclusion that many of these myopes were originally only astigmatic, and that their myopia is in a great degree due to the ill-advised adoption of concave glasses. I believe that it is in the highest degree imperative, in treating a case of incipient or progressive myopia, to make a careful examination of both eyes for astigmatism, and, if found, to correct it. I hope at a future time to have something more to say upon this subject.

convex cylindrical lens of equal focus. Such a lens has no proper focus for parallel rays, but it may be said to have two approximate foci corresponding respectively to the meridians of greatest and least curvature. At the nearer of these approximate foci, the image of a point of light received upon a screen, takes the form, not of a point, but of a line corresponding in direction to the axis of the cylinder, upon which the cylindrical surface is ground. At the farther focus a similar linear image is formed, but at a right angle to the first. Between the two foci no distinct image can be obtained, but only a rounded spot of diffused light, which will appear of a more or less elongated shape, according as it approaches either of the foci. If, instead of the point of light, we observe the image of an elongated object, such as a window bar, we shall obtain a well-defined image at one or the other of the foci, according as the bar corresponds in direction with one or the other of the two linear images of the point of light. At intermediate distances and angles no distinct image is formed.

The analysis of the visual phenomena of astigmatism would be as simple as in the case of the spherico-cylindrical lens were it not for the disturbing influence of the accommodation. In Am and M+Am this is, under certain conditions, true. At the far point of distinct vision, corresponding to the meridian of least refraction, the retinal images will actually conform in character with those observed in the case of the lens, and the only effect of accommodative efforts will be to throw the whole image out of focus, and so render vision still more defective. In Ah, on the other hand, the eye when at rest is in a condition to receive a distinct image of lines lying in the direction of the meridian of least refraction, while a certain effort at accommodation will suffice to change the adjustment of the eye so as to adapt it to lines lying in the direction of the other principal meridian. With intermediate degrees of accommodative effort, however, vision will be less distinct than at these two points, and the eye will, therefore, either instinctively adapt itself to one or the other of them, according to the peculiar conformation of the object under inspection, or else will unconsciously oscillate from one to the other, so as to make out in succession as many features as possible. So also in H+Ah there will be one degree of accommodative effort suited to one meridian of most distinct vision, and another degree suited to the other meridian, and the unconscious changes from one to the other, and back again, will most effectually confound any attempts to estimate the degree and direction of the astigmatism. Similar disturbing acts of accommodation take place in near vision, also, in all cases in which the two near points fall near enough together to admit of this change from one to the other. Thus, in reading, the eye instinctively adapts itself to the refractive power of the meridian, which admits of, on the whole, the most distinct and easiest recognition of the letters, but as soon as any doubt arises as to any particular sign or letter, an involuntary effort shifts the adjustment to the other focus, with, perhaps, an equally

unconscious rotary movement of the head or of the book. So long as the range and region of accommodation suffice for these adjustments, so long may the phenomena of astigmatism be overlooked in the mass of confused and seemingly inconsistent experiences, and this explains how it is that so many cases of astigmatism are first detected when the eyes have become presbyopic, either from the approach of old age, or in consequence of original hypermetropia.

The phenomena of astigmatism are also frequently masked by a difference in the refractive power of the two eyes. Thus, with a difference in refractive power equal, or about equal, in degree to the astigmatism, it may happen that, by the use of both eyes, lines corresponding in direction to the two principal meridians will be distinctly seen, while lines intermediate in direction appear confused.[1] So far, binocular vision may be an improvement over the use of one eye, but, unfortunately, the effect of the combination upon the image of a point is to transform it, not into a simple line, as either eye would do by itself, but into a cross. Here, then, the simultaneous use of the two eyes may materially detract from the distinctness of vision.

Similar anomalous results may be observed where the refractive power of the two eyes is equal, but when the direction of the principal meridians varies. In the greatest number of cases of astigmatism, especially in the lower grades, the direction of the principal meridians undoubtedly approximates to the vertical and horizontal, but generally with a very appreciable variation. This variation is oftenest symmetrical, but the exceptions are exceedingly common.

In the investigation of refractive anomalies of the eye, it is of the first importance to eliminate the disturbing influence of accommodative efforts, for in this way only can we in any case be certain to detect even a pretty high grade of astigmatism. This is best attained by the employment of rather large test-diagrams, hung upon the wall at a distance of fifteen or twenty feet, so as to avoid the necessity of sensible convergence of the visual axes. In the negative forms of astigmatism (Ah and H+Ah) the eye must be fitted with a convex lens of sufficient power to neutralize, or perhaps a little more than neutralize, the hypermetropia, so as to convert the case, for the purposes of the examination, into one of Am or M+Am. If we have to examine a myope for astigmatism, we must test his vision either without glasses, or with such concave glasses as shall leave a little of the myopia uncorrected. The disturbance caused by accommodative efforts may also be overcome by the use of optometers based upon that of Dr. Young (*Philosophical Transactions*, 1801). Such an optometer, with a stelliform diagram, has been employed by A. Burow

[1] In this fact lies an important chance of error in the use of the common test diagrams, constructed of vertical and horizontal sets of lines.

(*Archiv für Ophthalmologie*, IX. Band, Berlin, 1863); and more recently, with many improvements, by E. Javal (*Annales d'Oculistique*, tome lv., 1866).

2dly. In view of the great difference which often exists in the refractive phenomena in the two eyes, the examination should always be conducted with one eye at a time. This is greatly facilitated by the use of a little screen hung by a pivot to the centre of a pair of trial spectacle-frames; when the screen is placed parallel to the visual axes, the test object is visible to both eyes; to exclude the vision of either, it is only necessary to turn the screen through a small angle to the right or left.

3dly. The method employed must be competent to the detection of astigmatism, in whatever direction the principal meridians may happen to lie.

4thly. It must afford the means of accurately measuring the direction of the principal meridians.

5thly. It must provide for the accurate measurement of the refractive power in the two principal meridians, or the difference in refractive power in these meridians.

Lastly. Having corrected, by experimental glasses, any ametropia or astigmatism which may have been discovered, the state of the accommodative function should be investigated. The eyes should then be tried together, or, if the difference in the two eyes is too great for useful binocular vision, it may be of advantage to correct them singly, one for near and the other for distant vision, thus keeping both eyes in habitual use, and conferring the incidental benefit of distinct vision both of near and of distant objects without changing or removing the glasses.

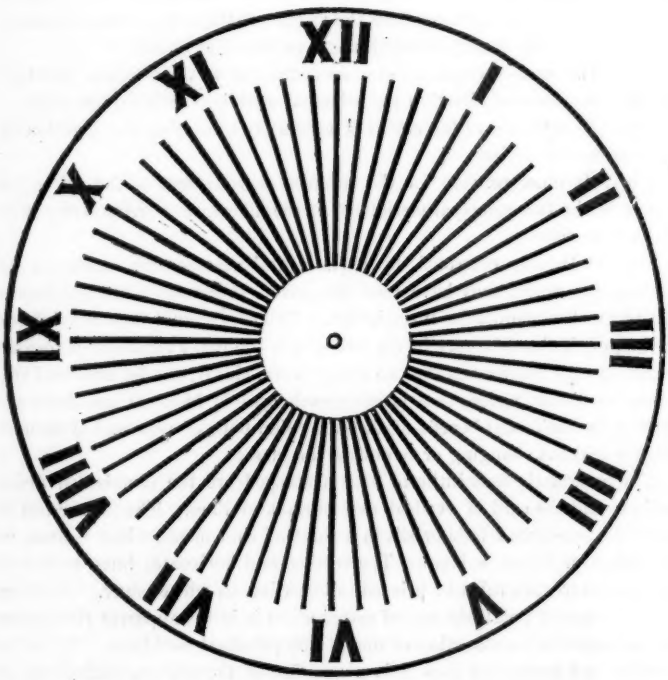
The astigmatic tests hitherto most employed are the illuminated point or line, and the card of vertical and horizontal lines. The former test is made by punching a hole or slit in a sheet of thin metal, which is hung in a window or before a lamp. The vertical and horizontal lines, in sets of three or more, are ruled or printed in black ink on white paper. In using the illuminated point, the test of astigmatism is in the apparent elongation of the point in the direction of one of the principal meridians. With the vertical and horizontal lines it is a question of the relative distinctness of the two sets.

These tests, as ordinarily employed, are not very satisfactory in practice. The changes in the apparent form of the bright dot are not very conspicuous, and it is not always easy for the person examined to give an accurate and intelligible statement of what he really sees. The vertical and horizontal lines would answer well enough, if they always coincided in direction with the meridians of greatest and least refraction; but this is rather the exception than the rule. Both tests are subject to certain fallacies, and they give but a rough indication of the direction of the principal meridians. They are both, however, susceptible of improvement, the line tests by simply increasing their number and giving to them various degrees

of inclination, the dot tests by multiplying the dots and arranging them in rows of different degrees of inclination.

The tests which I employ are made up of radiating lines, or of radiating rows of dots. The line tests, sixty in number, are printed in black or colored ink on a white card, and are arranged as radii of a circle. These lines are severally distinguished by a graduation around the circumference

Fig. 1.



of the circle, like the hours and minutes on the dial of a clock (Fig. 1). Each line is equal in thickness to the lines employed by Snellen in the construction of No. XX. of his test-types, and is designed to be distinctly seen by an average eye at a distance of twenty feet. A second diagram is constructed of twelve sets of triple radiating lines printed upon a circular card, and corresponding to the twelve hours of the clock (Fig. 2). Upon a third card, also circular, a single set of three parallel lines is printed. The second and third cards are arranged to turn upon a pivot fixed in the centre of the first.[1] These cards are about nine and a half inches in diameter.

[1] This use of the clock dial, for which I am indebted to Javal, who has employed it in his very ingenious optometer, has the important advantage over all other

Fig. 2.

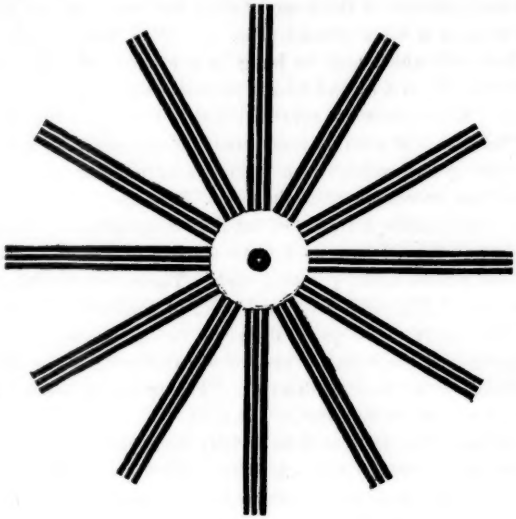
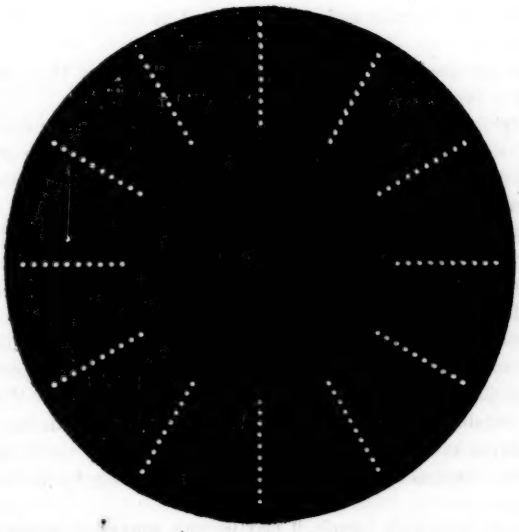


Fig. 3.



graduations of the circle, that it is one with which everybody is familiar. The first diagrams which I drew were made with thirty-two divisions, named after the thirty-two points of the mariner's compass.

The test-dots are arranged in from twelve to sixty radiating rows upon a circular card, similar to those used for the line tests, but are printed to show white upon a black ground (Fig. 3). They may also be punched through the card which may be hung in a window, with a background of thin paper. Upon a second card is printed a single row of dots similar to the first. These cards are arranged also to turn upon the pivot in the centre of the dial. If used as transparent objects, any desired inclination may be given by suspending them from one or another of the pin-holes figured near the circumference of the circle. The size of the dots or holes is, within certain limits, a matter of but little consequence. In cards with twelve radiating rows, I have made them about $\frac{1}{4}$ or $\frac{1}{8}$ of an inch in diameter; with sixty rows, about $\frac{1}{14}$ of an inch. These sizes correspond pretty nearly to Nos. LXX., XXXV., and XX. of Snellen's test-types. For smaller transparent test-objects, designed to be mounted in a lamp-screen, I have used the common perforated card-board of the shops, with holes about $\frac{1}{32}$ of an inch in diameter. The spaces between the dots I have made equal to the diameter of the dots.

These two kinds of tests may be usefully employed together, being in a certain way supplementary to each other. They enable us to determine independently, and with great accuracy, the direction of both principal meridians, and each may be made to serve in many ways to control and correct the results obtained by the other. They afford, also, a ready means of detecting any irregular astigmatism dependent on corneal or lenticular malformation.

Smaller test-diagrams, of about one-third the size of those described, are useful in the examination of strongly myopic eyes.

In applying these tests to the investigation of a case of possible ametropia, with or without astigmatism, one eye is to be excluded from participation in the visual act, either by the use of the little screen attached to the spectacle-frame, or by partially covering the eye with a card or book. The eye under examination is then directed to the diagram with the twelve radiating triple lines (Fig. 2), hung upon the opposite wall of the room.[1] The question may then be asked, whether any one of the twelve sets of lines is distinctly seen. The eye is then to be corrected, if necessary, by the weakest concave or strongest convex glass compatible with perfect vision of any one set of lines. Should all the sets of lines appear equally distinct during the trials with different glasses, and especially if the same result is obtained with the test-dots, we may confidently decide that the case is not one of astigmatism, and may proceed at once to the determination of the acuteness of vision and accommodative range by the well-known

[1] If the eye is strongly myopic, it may be more convenient to use a smaller test-object, which may be attached by a slide to a yard-stick, so as to form a sort of optometer.

method of Snellen. If, on the other hand, either with or without a correcting glass, the lines in one meridian are more distinct than in others, we may be sure that we have to do with a case of astigmatism. The direction of this meridian of most distinct vision is now to be carefully determined by the diagram with the sixty radiating lines (Fig. 1). To ascertain with greater accuracy the refractive power of the eye for this meridian, the card with the three parallel lines may now be placed upon the pivot, and turned in the direction of most distinct vision, as determined by the last observation. A few trials with stronger or weaker glasses will soon determine the proper correction for this meridian, which, if the examination has been properly conducted so far, will be the measure of any refractive anomaly in the ocular meridian of the least refraction. It only remains to determine the refractive power of the eye for the other principal meridian, which may be done by the use of common concave glasses in a stenopæic apparatus, or, still better, by the use of concave cylindrical glasses. The card last used is to be turned to a position at a right angle to the first, and concave cylindrical glasses, with their axes in the same direction, held successively before the eye until the lines appear as distinct as they appeared in the other meridian; if the stenopæic apparatus, with common concave glasses, is employed, the slit must be turned at a right angle to the direction of the test-lines. Having thus ascertained the weakest glass through which the three parallel lines are distinctly seen in the last position, we have in the focal distance of this glass the measure of the difference of refraction in the two principal meridians, or the degree of the astigmatism; the absolute refractive power of the eye in this meridian is found by adding this value to that already found for the other if the eye is myopic, or by subtracting it if hypermetropic.

Having thus determined the refractive power of the eye in the two principal meridians, it is well to test the result by means of a trial-glass, made either by the combination of two cylindrical glasses adapted to the different degrees of refraction in the two meridians, or by an equivalent combination of a spherical with a cylindrical lens.

The other eye is then to be tested in precisely the same way as the first, and the result controlled in the same manner.

Having thus fitted the two eyes with experimental glasses, they should be tried together in binocular vision, using all or any of the test-diagrams, the final test being always the equal and uniform distinctness of all the lines or dots in all parts of the diagram.

If any presbyopia or accommodative insufficiency is present, it may now be estimated by placing a pair of convex glasses, fitted in a frame as a temporary eye-glass, in front of the trial-spectacles, and testing with the smaller types of Jaeger or Snellen.

These test-diagrams may be variously modified in form, and with advantage, for it often happens that a person not accustomed to analyze his

visual perceptions may fail to appreciate a defect which a second observation, made upon another diagram, may reveal. Thus the meridian of most distinct perception of the lines in Figs. 1 and 2 is the opposite of that in which the dots in Fig. 3 appear most distinct one from another. By arranging the same test, too, in different ways, it is possible to ask the same question several times in succession without seeming to do so. For reasons of this nature, as well as to provide a good test for astigmatism more exactly comparable with Snellen's test-types, I have arranged a diagram (Fig. 4) in which short lines or sets of parallel lines of successively increasing degrees of inclination are placed in a linear series, instead of in the form of radii of a circle.

Fig. 4.

Test-letters may also be employed, with a certain advantage, in the detection of astigmatism. Thus a letter from one of the larger series of Snellen—as No. XXX.—may be repeated several times, always of the same superficial area, but varied in the proportion of height to width (Fig. 5). These letters, which are of common use in ornamental printing, under the names of condensed and expanded letters, are seen by an astigmatic person with very different degrees of distinctness, that particular letter always appearing the clearest whose long diameter corresponds most nearly with the direction of the meridian in which the line tests are most distinct.

Fig. 5.

These short test-lines, and expanded and condensed letters, serve also to illustrate the different degrees in which the legibility of different styles and kinds of letters is affected by astigmatism. Thus the capital Roman letters are not properly comparable with the small letters, and still less with the large or small Italics. Neither ought Roman letters to be compared with writing characters, or with German, Greek, or Oriental texts. Much depends,

too, upon the proper spacing of the letters in the lines, as well as of the lines themselves, for the same astigmatic eye may, with different degrees of accommodative action, be troubled either by an apparent running together of the letters, or by confusion of the lines.

Test-letters for determining the acuteness of vision should be constructed, therefore, not only of sizes proportionate to the distances at which they are designed to be used, but also in such a manner as neither to exaggerate nor conceal the visual defects due to astigmatism. To this end they should be made up, so far as may be, in about equal proportions of vertical and horizontal lines of uniform thickness. Each letter, too, should be, as nearly as is consistent with good proportion, of equal height and width, and the spaces, both between the letters and the lines, should be proportionate to the size of the letters. These conditions were first realized by Snellen, in his "Letterproeven," or "Test-types," published in Utrecht in 1862, and now almost universally adopted as the standard of visual comparison. It is possible, however, that the very simple "Gothic" form of letter **TH** may be preferable to the somewhat more complex "Antique" letter **TH** adopted by Snellen; the experiment has been partially tried in a recent work by Dr. Williams, of Boston (*Recent Advances in Ophthalmic Science*, Boston, 1866).

ST. LOUIS, October, 1866.

ART. VI.—*New Method of Employing Heat as a Resuscitating Agent.* By JOSEPH G. RICHARDSON, M. D., Union Springs, Cayuga County, New York.

IN the number of this journal for January, 1866, on p. 225, appeared the abstract of a paper by Dr. B. W. Richardson, of London, detailing the commencement of an investigation into the means for rekindling the vital spark when almost extinct, which gave promise of very important results, had not the experimenter's attention been diverted to the opposite desideratum of accomplishing a temporary local death; which he did by the application of ether spray, an invention that has been received, and justly, with so much eclat by the profession both of Europe and of our own Western Hemisphere.

The following case occurred to me shortly after reading the above mentioned digest of Dr. Richardson's paper, and it was during the long hours of anxious night-watching over its subject, the uncertain pulsations of whose feeble heart I was so earnestly striving to invigorate, that those experiments led me to the practice which proved so successful in renewing its

frail life, and which I propose briefly to narrate, hoping that it may assist some brother practitioner under circumstances of similar urgency:—

On the 17th of February, 1866, I was called to attend Mrs. J. McC., a healthy woman of robust constitution, whom I had delivered some two years before of a still-born infant after a very protracted and exhausting labour, the consequence of a marked narrowing of the pelvis at its inferior strait. Finding that parturition was again rapidly approaching, and that the pains were active and frequent, I immediately examined per vaginam and discovered a breech presentation, which, coupled with the probability of another tedious labour, even under the most favourable circumstances, rendered the prognosis as regarded the child's life a very serious one. After the anticipated delay, delivery was accomplished about half past one o'clock on the morning of the 18th; but the infant, when born, was completely relaxed, and made no effort to respire, although a feeble pulsation was perceptible at the præcordia. The usual treatment of the hot bath, cold affusion, &c. &c., being employed without effect, I resorted to artificial respiration, and after a few repetitions of the mouth to mouth process of insufflating the lungs, finding that the heart seemed to beat with a little more force, I was encouraged to continue the treatment. Half an hour elapsed, however, without any further sign of life, and I was about to abandon the case as hopeless, when the child gave a single gasp which was succeeded by others at intervals of nearly a minute; still continuing artificial respiration, I now sought to reinforce it by bathing the chest with whiskey, moistening the lips and tongue with a mixture of spirits of ammonia, applying mustard to the feet and epigastrium, and friction to the extremities; but although by these means voluntary inspiration was obtained at decreasing intervals, until, at the end of two hours, phrenic contraction occurred about every twenty seconds, yet I had the disappointment of finding that whenever artificial expansion of the lung was intermitted, as, through fatigue, I was several times compelled to allow it to be, the intervals between the voluntary efforts became greater and the cardiac pulsations grew more feeble. Seeing, therefore, that the treatment hitherto had in reality accomplished only a temporary and evanescent resuscitation of the powers of life, and spurred on by the obvious necessity of some more potent means, I mentally reviewed the record I had so lately read of Dr. Richardson's remarkable success in restoring the heart's motion by injecting hot blood into the coronary arteries, and after many fruitless efforts to invent a feasible plan for applying that process in the case before me, hit upon the simple expedient of heating the blood in the veins themselves, and then assisting by external pressure to force it back to the heart; with the expectation that with the partial absence of that usual refrigerating agency, inspired air, it would pass over the short pulmonic circuit and be distributed to the cardiac structure without any material diminution of temperature. To carry out this idea I directed a hot fire to be kindled up in the large cooking stove, and having made a bed of old flannels on its ample hearth, I laid the corpse-like body upon it, and with the assistance of some attendants heated the child's legs and arms alternately only a little short of the blistering point, and then by firm centripetal friction drove the hot blood along its desired course. The effect of this treatment was almost miraculous; the heart's pulsation, which, in spite of three hours' labour with artificial respiration and its adjuncts, had continued feeble and uncertain, grew rapidly full and energetic; the respiration, which had commenced again to prolong

its intervals, changed its gasping character, became continuous, and although groaning, otherwise almost normal; and to crown all, the limbs, which had heretofore dangled relaxed from the apparently lifeless trunk, soon exhibited signs of vitality, which, beginning first, after some ten minutes roasting, with a slight tremulous movement of the extensors of the right leg, gradually traversed the entire muscular system until the whole tiny frame shook like an aspen leaf, quivering, one might almost think, with too rude a blast of the breath of life. I remained with the infant for an hour or so longer and experienced the intense satisfaction of observing a continued, though tardy improvement, the skin gradually losing its blue colour and assuming the pink tint of a healthy new-born babe's. Being then compelled to visit some patients at a distance of several miles, I reluctantly left it in charge of the attendant, with the strictest injunctions against attempting to give even the smallest particle of food or drink, fearing, as I did, that the muscular movements were not yet sufficiently established to enable it to swallow. On returning about two o'clock in the afternoon, I can hardly describe my vexation at finding that some ignorant and officious old woman of the neighbourhood had insisted on feeding it with some molasses and water, and that, to the consternation of the mother and nurse, it had, after a few ineffectual struggles, expired in the effort at deglutition.

The arduous duties of a country practice have debarred me from any extended investigations in this matter, but the following experiments performed on the 29th of August, 1866, tend to prove the correctness of my supposition that the circulating fluid could be so far heated through the walls of the bloodvessels as to be rendered active in re-establishing the cardiac movements.

The subject in this case was a young chicken that had been accidentally drowned; carefully opening the thorax in such a way as to avoid any large arteries or veins, I found the heart still beating at 7.55 A. M., twenty minutes after the last gasp, which occurred directly on removal from the water; in ten minutes more it ceased to pulsate naturally, although answering readily to external irritation with the point of a knife, and like the pendulum of a clock almost run down, it would vibrate more and more slowly for some minutes. At 9 A. M., one hour and twenty minutes after respiration ceased, the heart, remaining in situ, was exposed to the heat of a stove under circumstances as far as possible precisely resembling those to which the infant above mentioned was subjected; after submitting it to this heat for one minute, the cardiac movements which a short time before, even under the stimulus of puncture, had been weak and uncertain, recommenced strongly and regularly at the rate of about fifty beats per minute; when the body of the fowl, however, was removed from the fire these contractions gradually diminished until they ceased to be voluntary, and even irritation was feebly responded to. At 9.50 A. M., two hours and a quarter having elapsed after death, the heart was slightly moistened with warm water and again heated as before; without any other agency the auricles and upper portions of the ventricles, which had become relaxed and shrunken, voluntarily contracted and resumed their normal rhythmic movements, though at the rate of only eighteen pulsations per minute, and this continued for some little time after removal from the source of heat. Lastly, that no doubt might remain as regarded the revivifying power of fire (in this subject at least), I waited another twenty minutes until the cardiac pulsations

had again become silent, and then found them to be restored (though at the slower but still regular rate of one in five seconds), by a further application of the life-renewing heat.

Dr. Sansom, in his recent work on the *Action and Administration of Chloroform*, details, in his chapter on Resuscitation, from apparent death by that agent, two experiments of his own which have some bearing upon this subject. In the first—

"The movements of the exposed heart of a kitten were arrested by chloroform vapour, then a jet of steam was directed upon the organ; the effect was instantly to restore rhythmical contraction. (2.) A rabbit was chloroformed until apparent death took place. After a few inflations of the lungs the chest was opened and the heart found beating rhythmically. Warm air of a temperature of 98 Fahr. was blown into the lungs by means of a pair of bellows, an elastic catheter being introduced into the mouth. The heart's pulsations were certainly increased in force and rhythm (?) a contraction of the ventricles taking place just after each inflation."

Thus it will be seen that the result of Dr. Sansom's first experiment accords precisely, so far as it goes, with that furnished by my own, and as regards his second, may not the current of warm air injected into lungs have produced its beneficial effects by imparting caloric to the blood while contained in the vascular network of the pulmonary vesicles, from whence it would be driven in a few seconds into the coronary arteries and then exert its stimulating power upon the cardiac structure? Were it not for the danger of causing pneumonia, heating the blood thus through the lungs would be a great improvement on the plan above described, but while blistering, or even burning the skin upon portions of the extremities, would prove but a minor evil in comparison with the individual's death, production of such acute *pulmonary* inflammation must imperil the very life we seek to save.

I may further mention, as, in its small way, an analogue to the primary fact upon which Dr. Jenner based his immortal discovery, that a few weeks after attending the infant as above narrated, I was called to see a little son of one of the largest sheep-breeders in this section, and, during my visit, observing a huge basket in the corner of the dining-room, from which issued an almost continuous bleating, was naturally led to inquire about the lambs. I learned that those which seemed feeble were brought into the house, dried, warmed, and fed with whiskey sling, by which means most of them were restored, but I noticed that while a number struggled in a purposeless way around the basket one lay with its eyes closed and to all appearance dying; of this the owner remarked: "That fellow is pretty near gone; nothing but roasting will save him." In some surprise at the coincidence, I inquired whether that was of much service. "Oh, yes," replied Mr. C. "When everything else fails I put them close before the stove and give them a good roasting; *that often brings them to life again;*" adding, afterwards, "It's astonishing what an amount of heat they will bear, and do them good too." Thus forcibly illustrating by his experience the truth so

often noted, that our boasted science, while it teaches us to work intelligently and with a skilful adaptation of varying means to diverse ends, is yet on many occasions a tardy guide in comparison with popular observation.

If, as an English writer has remarked, the spirit of the Royal Humane Society's directions for resuscitation can be summed up in the one word *Warmth*, this proposition may be expressed as simply to advance another step, having the monosyllable *Heat* for its exponent; and I hope that some of the many readers of this journal who have more abundant opportunities for such experiments, will investigate and report the practical value contained in the suggestion of artificially heating the blood (not warming it merely, as has been heretofore advised) within the limbs of persons apparently dead, and then propelling it as rapidly as possible towards the heart, the pulsations of which are probably, in some instances at least, so weak and infrequent as to escape observation for minutes before they finally cease. The method seems to promise somewhat not only in the cases of still-born infants, but also in those of patients asphyxiated by drowning, hanging, or the inhalation of noxious gases, especially the vapour of chloroform, and it possesses the great advantage that its essentials are almost always readily accessible.

ART. VII.—*The Permanganate of Potash in the Treatment of Carbuncle.* By THAD. L. LEAVITT, M. D., of Germantown, Pa.

THE beneficial effects accruing from the local use of the permanganate of potash in the treatment of sloughing ulcers, phlegmonous erysipelas, and hospital gangrene, having been most thoroughly tested and proved during the last year of the war, in army hospital life, it occurred to me that its peculiar remedial qualities would alike prove successful in that most painful and distressing lesion, carbuncle, originating as it also does, from a depressed vitality, and a morbific condition of the blood. The most satisfactory and encouraging results have been obtained in the only cases in which I have had an opportunity to employ it.

Mrs. R——, æt. about 60 years, was visited, during the absence from town of her family physician, and found suffering terribly from a carbuncle located upon the left shoulder-blade, just above the spine of the scapula, and occupying the supra-spinous fossa. Loss of sleep, constant pain, and a naturally nervous temperament combined, induced a mental disturbance almost amounting to delirium. The tumour was in its sixth day, with all the general accompaniments, of the size of a hen's egg, tumid, tense and shining. A free crucial incision had been made two days before, but with no relief; dense areolar tissue, puffy granulations, and sanious oozings crowded the track of the knife, with no appearance of separation or healthy action. The pulse was quick and compressible, 110 beats in the minute;

countenance anxious and expressive of great pain. Bowels regular. A strong solution of the permanganate of potash (ʒss to fʒj) was immediately applied with a brush, and a dressing saturated with it covered with oiled silk placed upon the shoulder. Anodynes, beef-tea, milk punch, tincture of the chloride of iron and quinia were administered. The same evening the patient was again seen and expressed herself as feeling much relieved; pulse 98, and gaining in volume and elasticity. The next morning the dressing was removed, and already, although but twenty-five hours had elapsed, true pus had begun to form, the intense pain had subsided, and the patient, to use her own language, declared it "a miracle;" the pain had vanished, the fever was gone; she had slept well and felt some appetite for food. A few days longer the potash was continued; the slough separated, and the wound healed in the short space of one week.

Mr. C——, æt. 50 years, shoemaker; was visited July 30th, 1866. Had been sick three days, was found suffering intensely from a carbuncle situated upon the abdomen just below the umbilicus, of the size of a large walnut, and involving the surrounding structures in an erysipelatous inflammation. Bowels constipated; high fever; pulse 120; heavy breath; tongue furred; anxious countenance; great restlessness and general uneasiness characterized his principal symptoms. Hop and laudanum poultices had been applied, but he had been gradually growing worse, and approaching the condition described, the tumour increasing daily, the parts becoming more dense, and at last an ichorous pus exuded from several small openings. Mild purgation, after which supporting and stimulant treatment was instituted. A slight incision was made, and the permanganate applied, as in the previous case, the dressings being removed once in twenty-four hours. This case was seen seven days successively; the 13th of August he returned to his work, the severity of the suffering having been arrested after the first application.

Mrs. A——, æt. about 49 years, having suffered a few days from a supposed furuncle, and the pain becoming intolerable, called in medical aid. There was found upon the inner face of the left thigh, just below the nates, a well-marked, though small carbuncle; a very slight incision was made and the potash dressing used. No constitutional treatment at all was inaugurated; in three days all signs of carbuncle had disappeared, and the line of incision was healing nicely.

The results in this case were mutually gratifying from the fact that about six years ago the patient suffered from a series of carbuncles appearing in succession along the spinal column, from the back of the neck to the region of the lumbar vertebræ, and lasting all through the winter months, her dread and fear of similar suffering were very great. The permanganate of potash has been eminently successful with me in the treatment of chronic ulcers. The following case of many years' duration, and which had resisted all efforts, yielded to the remedial properties of this preparation.

Arthur M——, tavernkeeper, æt. 45 years, had a chronic indurated ulcer of sixteen years' standing, extending over the superior face of the right leg about four inches below the tubercle of the tibia, and spreading backward on both sides to the malleoli, covering a surface of about twenty-eight square inches, deep and burrowing in some localities, and in others merely

superficial; the whole leg and foot were much swollen and anasarcous, the toes merely protruding from a shapeless mass of flesh closely resembling the foot of a young elephant. An ichorous discharge of a horribly offensive character, together with filthy dressings, augmented the destruction of the surrounding parts.

The advice of an eminent surgeon had been secured a few weeks previously, to the effect that but one alternative remained, amputation; and indeed all appearances favoured such a decision. Proper abstinence, tincture of iron and good diet were directed. The local use of a strong solution of the permanganate of potash and judicious bandaging have already done so much for this case that, at the date of writing, the tenth application of the potash, six square inches, will more than cover the small amount of ulceration remaining, so rapid have been the healing process and the formation of firm healthy tissue; and, in a few days more, we can confidently prognosticate a complete cure.

ART. VIII.—*Bromide of Potassium in Epilepsy.*

By HORACE Y. EVANS, M. D.

IT is a matter of surprise that the bromides of potassium and ammonium have not come into more general use in the profession.

Dr. Hammond's little book awakened some of us to a realization of the fact that insomnia could be successfully treated without the use of opium; and further, that in many cases of wakefulness it was positively contra-indicated; yet how very few think of using the bromide of potassium in this affection.

Sir Charles Locock made public, years ago, his successful use of this remedy in hysteria; yet the old and offensive drugs are to this day used nine times where the more agreeable and effectual bromides are used once.

Delirium tremens can be throttled at its very outstart by this medicine, yet how rarely does a case in private practice escape the routine of opium, alcohol, blisters, digitalis, lupulin, and capsicum. In no disease have their beneficent effects been more marked than in epilepsy.

I propose, therefore, relating the three following cases of this disease out of eight within my knowledge, treated with the bromides.

CASE I. Farmer, æt. 30, living in a miasmatic region. Enjoyed perfect health until attacked with ague; was treated with quinia, and the chills checked. Then followed convulsions, which at first resembled, as far as the pulse was concerned, apoplexy, but soon became clearly epileptic. The attacks returned at irregular intervals of from seven to ten days. He had been carefully treated with remedies such as the symptoms from time to time indicated. When he came under my care he was using tonics and alteratives, and ice-bag to the spine. His pulse was 98, full and strong, tongue furred, bowels sluggish, disgust for food, very restless, severe head-

ache, and marked mental confusion. I continued the ice-bag to his spine half hour daily, ordered saline purge every day, and farinaceous diet. He was very soon visited by another convulsion which left him in a dull melancholy condition, severe headache and insomnia, but no paralysis; commenced next day with the bromide of potassium, gr. xv, three times a day; continued the saline mixture, ice-bag, and restricted diet. An improvement in all the symptoms commenced within twelve hours, and at the expiration of four weeks the patient was apparently well; there was no return or tendency to return of the convulsion. All treatment was then omitted, and at the expiration of seven weeks from the commencement of the treatment, considering himself well, he returned to the use of animal food, which was followed within ten hours by the most severe epileptic fit of any that he had had, and two days later by another. He then returned to the city and was again put upon the use of the bromide and the ice-bag. As at first, the improvement was rapid, and at the expiration of a fortnight, without my consent, omitted all treatment. He returned to the country, used promiscuous diet, and has now passed through the fever season of the locality without ague or convulsions. Says he was never in better health than at present.

CASE II. G. M——, a young man 21 years of age, apparently in a good physical condition, has had epileptic convulsions for the past fifteen years, and at the time of commencing his treatment (March, 1866) he was having, on an average, three attacks a day. He was ordered a saline purge twice a week, ice-bag to spine one hour daily; bromide of potassium, gr. xx, three times a day, and total abstinence from animal food. The interruption in the attacks was immediate; he continued without even an "aura," or any other evidence of the presence of the disease for nine consecutive weeks.

The peculiar effects of the bromine, named by Bazire bromism, having now become developed, the drug was omitted for two days, Huxham's tincture of bark, and a more liberal diet substituted. Before the end of the second day, a severe convulsion returned, and was followed by numerous aura epileptica or minor "spells." The bromide was immediately resumed and its use continued for three weeks without a return of the disease. The increased flow of saliva, sore throat, and restlessness, again gave premonitions of the return of bromism. The dose was now reduced to gr. x, ter die. Again the lurking foe took advantage of the truce and made several sorties which were repulsed by the bromide of ammonium, with the iodide of potassium as an ally. Another month now elapsed without an attack, but the combination last used became so offensive to him that it had to be omitted, and the bromide of potassium resumed in gr. xx doses, which is now (November) being used with results beyond the most sanguine anticipations.

CASE III. Mrs. S. B——, æt. 28, the mother of two children. Insanity and epilepsy in her family. After a serious family trouble, was attacked with convulsions at intervals of a fortnight. The disease was diagnosed hysterical epilepsy, chiefly on account of the long duration of the convulsion. The usual treatment for hysteria scarcely palliated the insomnia and almost delirium during the intervals. Having seen an account of Locock's treatment of this disease with the bromide of potassium, I was induced to give it a trial. She commenced with gr. xx doses three times a day, and an additional dose at night if necessary to produce sleep. Within a week every vestige of the disease had vanished. The medicine was continued in

reduced doses for a month, after which it was entirely omitted. Four months have since passed without a symptom of hysteria or epilepsy, notwithstanding the continuance and actual increase of her family troubles.

I have in my possession notes of other and aggravated cases of this disease which have been so far interrupted and modified by this treatment that the patients have been enabled to commence life almost anew. The three just given are the forms with which we most frequently meet, and therefore cover the whole ground; namely, first, those having an apparent or known cause; secondly, congenital; and lastly, hysterical. The first and third, we have every reason to believe, are cured. The second is so far palliated as to give periods of entire exemption ranging from three to four months. The *modus operandi* of this drug has never been satisfactorily explained. The authorities tell us that it has alterative, resolvent, and sedative effects upon the nervous system.

Looking as we do upon the convulsion as a symptom of the disease, and that the disease consists of an irritated and congested condition of the brain, medulla oblongata, or spine, then the ice-bag comes in as an important auxiliary in producing sedation—though in numerous cases the drug has performed the whole work single handed. It seems to me that the field of usefulness for this medicine is very extensive. It dispels a large proportion of the aches and pains met with in women. Neuralgia, refusing subservience to all other treatment, has yielded to this. So also with chorea, headache, and the forming stage of delirium tremens. It palliates the paroxysms of pertussis. Dr. M. A. Withers, of Pottstown, related to me a case under his care, of melancholy, culminating at times in insanity, which has been so far improved by the use of large doses of this medicine as to give strong hopes of eventual recovery.

ART. IX.—*On some of the Causes which render the Air in Surgical Wards Impure, with a Description of a Portable Ward Apparatus for Supplying Flowing Water, and all the Materials used in Dressing Wounds.* By THOMAS G. MORTON, M. D., one of the Attending Surgeons of the Pennsylvania Hospital, and one of the Surgeons of the Wills' Hospital for Diseases of the Eye, Philadelphia. (With a wood-cut.)

THE object of this communication is to point out some of the causes which render the air in surgical wards impure, the means of obviating them, and to offer an improved and more rational method of cleansing wounds.

The occurrence of erysipelas and pyæmia, and sloughing in wounds, at times, in hospitals, calls for such investigations, and also for the removal of

every source which even remotely might appear to favour the production of these diseases.

In most hospitals the wards are provided with a number of sponges and tin or earthenware basins for the washing of the wounds; generally one basin and sponge for each patient, which, after being used, are deposited under the beds, often in a damp, and not unfrequently in a wet state, and thus allowed daily to undergo a slow drying process. The ward air necessarily becomes in a degree contaminated, since it has been found almost impossible to free the tin basins and sponges thus used from odour; while the earthenware, the glazing being often defective, in a short time becomes ill-smelling from similar causes.

The method so commonly practised of sponging and responging wounds from the same basin of water is evidently objectionable, while in some cases it is positively injurious, for after a portion of the water has been once passed over an ulcerated, gangrenous, or sloughing surface, in the usual way, the entire bulk of water becomes more or less impure from its admixture with the discharges, and thus is rendered totally unfit to be brought again in contact with the wound.

Sponges have long been used for various surgical purposes; their peculiar nature allowing a great quantity of water to be retained in them. But from many hospitals they have been for ordinary ward purposes entirely discarded, for not unfrequently, through carelessness or otherwise, they have proved a vehicle for propagating disease. The expense attendant upon their use in contagious affections is considerable, where fresh sponges are required for each dressing, while, at all times, it is with great difficulty that they can be kept clean and free from odour.

A parcel of oakum, "the material of old tarred ropes, untwisted and pulled into loose hemp," makes an excellent substitute for the sponge, and will be found to answer every indication, especially with flowing water in dressing the wounds, and should be thrown away after having been once used.

The correct principle in washing wounds is in having a stream of water flowing continuously upon the part during the cleansing process, and in not permitting any portion of the water once used to be returned again in contact with the part washed.

The plan which I have lately introduced into the Pennsylvania Hospital is designed to improve the condition of surgical wards, by removing prolific sources from which odours arise, and especially by instituting a more cleanly mode of dressing surgical cases:—

1st. By dispensing with all the basins and sponges from the wards.

2d. By having a supply of fresh flowing water for each wound or part to be dressed, upon which the water once used is never returned.

With this arrangement, and in substituting the oakum for the sponge, the hands of the surgeon need not necessarily come in contact with the

wound or the water, thus lessening the chances of inoculation, for the force of the stream carries off all the discharges from the wound, the oakum aiding in the process by removing the more tenacious matters.

To carry out this method, and also to have in a compact form all the dressings used ordinarily for ward purposes, I had constructed an apparatus which consists (see accompanying figure) of a table or stand, three feet high, three feet long, and seventeen inches broad, supported on three wheels, two of these being twenty inches high, the rims of which are covered with leather, to insure less noise when moving through the wards; the third is smaller and placed at one end, in front, and moves upon a pivot, which allows the apparatus to be wheeled in any direction.

Upon the top of this table, and in the centre, is placed a tin reservoir capable of holding six or eight gallons of water; to a stopcock at the bottom, a small-sized gum-elastic tube, nine or ten feet in length, is attached, to the extremity of which there is a metallic tube four inches long, which is also provided with a stopcock to regulate more readily the flow through the tube.

On either side of the water-can appropriate places are partitioned off for the bandages, charpie, oiled silk, adhesive plaster, and jars for holding the lint soaked in the various solutions commonly used for ward applications; drawers are placed in each end and serve as receptacles for towels, instruments, etc. etc. One large tin bucket, with a projecting lip, occupies one-half the space under the table, into which all the refuse dressings, poultices, soiled water, and oakum, from each patient, are emptied. Another can, with two compartments, adjoins the bucket; into one of these the soiled bandages are thrown, while the other carries the fresh oakum, cotton batting, muslin, and old linen, used for the ordinary ward purposes.

One good-sized tin basin serves for the entire ward or series of communicating wards, since it serves merely as the receptacle for the water and discharges flowing from the part during the process of dressing. A can for hot water, for heating the adhesive plaster, completes the apparatus, which is pushed to the foot of each bed; the length of the gum-elastic tube and the elevation of the supply of water allow the stream to be carried to any part of the patient which requires cleansing, in either the recumbent or sit-

ting posture. The apparatus may be considered essentially labour-saving, since it combines, in a compact form, all the materials for the washing and dressing of the wounds, and removes all the refuse from the wards.

At the Wills' Hospital, several years ago, I had flowing water, upon a simpler plan, introduced into the dispensary and operating rooms. By this method the brushes and sponges used in making the various applications to the eye can be more rapidly and thoroughly cleansed.

In the surgical wards of the Pennsylvania Hospital, this apparatus and method of cleansing wounds has been in operation for several months, and has given entire satisfaction.

NOTE.—Since the above was in type, I have found, in looking over the *Lancet*, just received at the Hospital, *Observations in the Military Hospitals of Dresden*, by Alex. Bruce, F.R.C.S., in which article reference is made to "irrigators employed in washing out the wounds, and especially the long sinuses left by the tracks of the bullets" as being of great value.

"They simply consist of a tin vessel, with an aperture near the bottom, to which is attached an India rubber tube with a bone nozzle."

"By means of this contrivance a continuous stream can be made to play over the wound, and thus effectually wash out the sinuses without the use of the sponge. I regret to say that the latter were, however, in far too constant use, and, as servants can never be got to attend to precautionary measures, these sponges were frequently carried from patient to patient, necessarily often loaded with the very poison of pyæmia."

Thus the continuous stream of water for cleansing purposes has been found of great service in the military hospitals at Dresden, but any good which might arise from this arrangement is entirely done away with, from the fact that the most uncleanly practice of using the same sponges in many cases was followed by most disastrous results; for, as Dr. Bruce remarks, "I cannot but attribute much of the very serious pyæmic epidemic from which we suffered to the want of sufficient caution in small matters of this nature."

1421 CHESTNUT STREET, November, 1866.

ART. X.—*Case of Aphonia successfully treated by the Extirpation of a Fibro-epithelial Neoplasm from the Vocal Cords.* By EPHRAIM CUTTER, M. D., Boston, Mass. (Read before the Middlesex, Mass., East District Medical Society, July, 1866, and, by its particular request, published as a communication from that body.) With five wood-cuts.

SEPTEMBER 14, 1855, I was consulted by Miss Anna M. Jewell, of Pepperell, Mass., 28 years of age; school teacher. For the last five or six years her labours had not been excessive. She had always been well, until the present difficulty of aphonia, which commenced in September, 1862, with a cold and hoarseness as the primary symptoms. At first this hoarse-

ness appeared in the morning, disappearing during the daytime. There was no soreness, dyspnœa, dysphagia, or severe cough. She was hoarse both in and out of school, could talk aloud with an effort, and sing until September, 1864. In the spring of 1865 her health became so much impaired as to oblige her to give up her school. Still, besides the aphonia, there was little apparent disease, save a general weakness, loss of appetite, and troubled sleep.

She had previously received the advice of a number of medical men, but at this time was under the care of Dr. Miles Spaulding, of Groton, Mass. He treated the case judiciously on general principles, employing topical remedies, such as the nitrate of silver, iodine, &c. The patient not being relieved, Dr. Hitchcock, of Fitchburg, Mass., was called in consultation, who recommended disuse of voice with an appropriate general and local treatment. The aphonia increasing greatly, the patient was referred to the writer for a laryngoscopic diagnosis, there being, however, no suspicion of there existing any new growth in the larynx.

Her appearance on September 14th, 1865, was that of blooming perfect health, with a cheerful, lively disposition. She complained only of complete loss of voice. Her physician, Dr. Spaulding, spoke of her loss of strength, tendency to anæmia, loss of appetite, and enfeebled condition.

On physical exploration by laryngoscopy with reflected sunlight, a neoplasm, extending across the vocal opening from right to left, was immediately disclosed. It appeared, at the first examination, near its thyroid insertion on the right vocal cord, as a sessile, oblong, bluntly digitate tumour of the size of a split pea. It was white, or of a pale light red, according as the growth was compressed between the vocal cords, or liberated from their grasp by the opening of the glottis. At this first examination it was only possible to decide the presence of the tumour. There was great difficulty in the exploration from intractability of the tongue.

26*th*. The examination was repeated, with results which entirely confirmed the former diagnosis. At this observation the sessile nature and cauliflower character of the growth were also well made out, and shown to Dr. Spaulding.

It was seen to be a sessile tumour, involving the thyroid half of the right vocal cord, and was thought to be non-malignant from the absence of pain and its benign aspect.

In relation to treatment, it was positively asserted that it could be removed by surgical measures—that this removal could be effected either, first, by laryngoscopic surgery, after a thorough preliminary education of the tongue and throat, which would involve considerable time—or, second, by its ablation by laryngotomy, with the advantages of speedy and complete removal and no loss of time. It was proposed to leave the decision of the operation to the patient, who was a lady of great refinement, capacity, and intelligence—we rather advising the external operation. The patient, following the natural aversion to the risks of having one's throat cut, decided to select the former course, with laryngotomy as a reserve. She returned home with instructions to repeatedly introduce foreign bodies into her throat, such as the fingers, spoon handles, ivory-tipped whalebone bougies, &c., in order to educate the throat to the tolerance of their presence.

In October she came under personal supervision for about ten days, during which time she was exercised in manipulations of the tongue, position of head, and various kinds of illumination, in order to render the

parts tractable and fully expose the tumour. At the expiration of this interval she returned home, having made quite commendable progress. Her difficulty was not in nausea or intolerance of the instruments or manipulations, but in a persistent, upward and backward position of the base of the tongue, its convexity accurately fitting into the concavity of the arch of the soft palate, thus occluding the view.

Circumstances prevented the renewal of the treatment until December, 1865. She was daily practised upon till the education seemed complete enough for the practice of surgical interference.

In the mean time the seat and optical characters of the whole tumour were completely made out. It proved to be a sessile tumour, its seat ex-

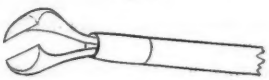
Fig. 1.

APPEARANCE OF THE GROWTH IN LARYNX BY LARYNGOSCOPE.—1. Epiglottis. 2. Arytenoid cartilages. 3. Neoplasm, covering the whole upper surface of the right vocal cord. 4. Do. on left vocal, leaving the arytenoid half uncovered.

tending over the whole upper surface of the right true vocal cord and the thyroid half of the left true vocal cord. Its surface was divided up into a large number of subglobose protuberances or bosses of varying size.

From its non-pedunculated character, it was proposed to remove it by Leiter's laryngeal forceps, with a double blade, modified from that furnished with the instrument which is adapted to pedunculated growths springing from the sides of the larynx, having the cutting edge on its lateral surface. The one contrived has a cutting edge on its bottom surface, much like the common tweezers (Fig. 2). This instrument closed would

Fig. 2.



Dr. Cutter's modification of sessile forceps, adapted to the removal of sessile growths.

be introduced into the larynx guided by the mirror and put in contact with the tumour. Then by relaxing the spring, the blades could be opened, and the tumour seized and portions avulsed by closing the spring and removing. Sometimes the grasp was so firm and the force applied to the growth so great that it could not be brought away without danger of breaking the instrument. The applications were conducted once or twice daily. As time was not a matter of consideration, the sittings were not protracted beyond the beginnings of nausea and retching, which almost always resulted. Some pieces were removed at almost every sitting, in all amounting to perhaps one-third of the bulk of the tumour. Other contrivances for the removal of the growth were employed, such as the Leiter's knife and Semeleder's sickle knife, besides various shaped knives of the author's invention. The difficulties with the tongue all this time were very great. It proved to be, indeed, a large, rigid, and unruly member. Spatulæ of various sizes and shapes

were tried without success. The persistency with which the tongue approximated the soft palate as well as the posterior pharyngeal wall was surprising and vexatious. Another difficulty was the general prone condition of the epiglottis. The best contrivance resorted to for obviating these difficulties was the inducing laughing, a condition in which the throat becomes open. When the patient was made to laugh, the tongue descended and the epiglottis became erect, and a good view could be obtained and then a portion could be removed. There was an unexpected difficulty in this case; her throat-education, instead of improving, rendered her tongue more unmanageable. So that notwithstanding a large portion of the polyp was removed February 3, 1866, and another large piece on the 9th, by the 14th the throat became so exceedingly irritable that it was impossible to secure any but the most unsatisfactory views, and the patient was advised to return home and afford rest to both herself and physician.

Fig. 3.

Portion removed by laryngoscopic surgery — in vial. (Natural size.)

On her return three weeks afterwards, she complained of pain and weakness in the upper third of the front of her chest, and of an indescribable uneasy feeling of an insufficient supply of air. The aphonia was about the same. On laryngoscopic inspection the polyp was found to have increased in size, filling up more than one visible half of the larynx. It presented the aspect of a whitish cauliflower excrescence, deeply and irregularly indented into subglobose masses, presenting somewhat the appearance of a compactly pressed bunch of small grapes. It was sessile, and its base was attached to the whole upper surface of both vocal cords, except arytenoid half of the left vocal cord. The tongue had not improved in its tractability by rest, and it seemed as if it never could be tamed. It was then decided to remove the growth by laryngotomy, for the following reasons: 1. The size and sessile nature of the tumour. 2. The inability to obtain at will, successful and protracted views of the neoplasm. 3. Its rapid increase, threatening the viability of the patient. 4. The certain prospect of the immediate and complete removal of the growth, and consequent expectation of the more speedy recovery of health, if not of voice. 5. The benignancy of the neoplasm, implied from its appearance to the naked eye; the entire absence of pain, and the microscopical characters of the parts already removed, viz., simple connective fibres in the deeper parts and aggregated pavement epithelium at the peripheral portions.

The operation was advised more to save life than voice. In case the growth recurred the operation would be justifiable as exhausting measures of human interference.

March 30, 1866. The polyp was removed by laryngotomy at the farm residence of Mrs. R. Jewell, Pepperell. As the locality was remote, I provided myself with the following instruments and medicinal agents: *Scalpels*, with curved and straight edges; *bistouries*, sharp and probe-pointed, straight and curved; *forceps*, artery-curved, dissecting, dressing, laryngoscopic, polypus, self-closing, and self-fastening; *scissors*, straight, curved on edge and sides, and hawks-bill; *directors*, *curettes*, one silver tracheotomy tube; two double tined blunt hooks; two single tined toothed and untoothed hooks; some peculiarly shaped knives on curved terminations

accommodated to the concavity of the larynx both sides; one of Smith's watch-spring tracheotomy dilators; *needles*, straight, curved, and three sided; silk and cotton ligatures, sticking-plaster; two of Charrière's finest pocket cases, embracing a large duplication of first class instruments. One pound Squibb's ether; one pound common ether; chloroform fℨiv; persulphate of iron ʒij.

The day was clear, cool, and airy. At 10.15 A. M. the operation was commenced by administering ether on a sponge placed in the apex of a loosely-formed cone made of a common newspaper. A contrivance that worked admirably, and I believe was suggested by Dr. Spaulding. There were present Drs. Miles Spaulding, of Groton; George F. Shattuck, of Pepperell; George M. Howe, of Framingham; and W. A. Webster, of Groton.

The patient was placed in a low wooden, old-fashioned arm-chair with the front legs elevated about four inches. The back of the chair reached to the shoulders so that the head could be easily bent backwards. When the patient was completely etherized, steadying the parts with the fingers of the left hand, I made, with curved bellied scalpel, an incision in the median line, about three inches in length, from the hyoid bone downwards, cut carefully through the fat to the fascia which was elevated by the forceps, nicked, a director entered, and the parts cut with a sharp-pointed bistoury. Then with director, knife point and handle, and fingers the tissues were cut, and retracted from the median line, until the hyo-thyroid membrane, the thyroid cartilage, the thyro-cricoid membrane, the cricoid cartilage, and the three uppermost rings of the trachea with their membranous interspaces, were fully exposed. The exposure of these tracheal rings was made, so that, in case it should become necessary, the tracheotomy tube might be early introduced by simply separating the lower part of the wound and incising the trachea.

It was deemed proper by myself to abandon the use of the tube, if possible, on the principle that foreign bodies in the air-passages should be avoided, and also from the consideration that the new growth when removed would leave more space for the air than there was before the operation. In case of dyspnœa from inflammatory exudations, the introduction of the tube would be easy. As it happened, the tracheotomy tube was not even required to be used at all.

When it is understood that it is the approved custom of surgeons in like cases to perform tracheotomy and introduce the tracheotomy tube for twelve or fourteen days previous to the performance of laryngotomy and the removal of the growth, the particular significance of this modification will be made to appear. It avoids two operations, takes less time, and in this case would have been absolutely unnecessary.

At this stage the crico-thyroid artery was tied. There was no sign of the isthmus of the thyroid gland. Some ten or fifteen minutes were then spent in waiting for the complete cessation of hemorrhage, which was not very considerable. The thyroid cartilage not proving ossified, the sharp point of one arm of a small pair of scissors curved on the narrow edge was inserted with the concavity upwards in the middle of the crico-thyroid membrane, until it disappeared up to the shoulder in the larynx. A single closure of the scissors sufficed to lay the larynx open. The advantages of the use of scissors were deemed to be the avoidance for admission of air until the cut was made, as the instrument filled the wound completely, the celerity of the cut, the greater nicety of cutting in the median line, as the

direction could be completely governed with an instrument so familiar as the scissors. The wound was enlarged by the same instrument up to the hyoid bone. The parts were then held apart by two assistants with two-tined blunt hooks. They answered perfectly, one tine dipping in out of

Fig. 4.

One of the two-tined blunt hooks for holding apart the laryngeal opening, improvised and made by the writer from common dinner table forks.

the way in the larynx above the ventricular band, and the other disappearing below the vocal cord. The bluntness of tips prevented penetration into the parts. The interspace was occupied by the growth. This form of hook was employed by my father the late Dr. B. Cutter, as a powerful, cheap, and useful hook in post-mortem examinations. It is figured in *Heister's Surgery*, London edition, 1757, vol. i. tab. viii. fig. 3. Its use in this operation is, I think, orginal with the writer. At the instant of opening the larynx the air rushed in with a whizzing noise. Coughing was excited, but ceased after the expulsion of a considerable quantity of blood which was propelled through the opening to the distance of several feet in front. After the coughing the respiration was very tranquil. The larynx was quiet and manageable, very fixed, probably from the hooks and partly from the fact that a warm moisture was maintained in the room by evaporation from a large tin pan on the stove not only during the operation, but also during the convalescence. The polypus was divided and bleeding. It appeared to fill the whole rima glottidis in the form of a cauliflower excrescence subdivided in small globose bodies like a very diminutive bunch of grapes. On the larger lobes were regular lines, some of them dividing up the surface into quarters and some into six or seven pieces, like the division of a cut pie. It was well disclosed, and was exceedingly accessible to the application of instruments besides its fixidity. The growth was readily removed in a few pieces by seizing with forceps and excising with scissors curved on the side and edge. My own special knives were not used. The opening was repeatedly cleansed of blood and mucus, by means of small cubical masses of sponge held in forceps. Besides this quantities of blood and mucus would be very forcibly expelled, after which all would be quiet. The etherization was maintained at intervals through the opening. No ulceration or other abnormal appearance was detected in the larynx.

Fig. 5.

Represents the neoplasm removed by the laryngotomy, in the bottle (natural size).

After having fully removed the growth, and after my associates had inspected the parts and concurred with my conclusion as to the completeness of the ablation, the seat of the growth was freely touched with solid nitrate of silver. The hooks were withdrawn, the wound held

together, and breathing was found to be easily maintained per orem. The patient was allowed to recover from the etherization, and we waited to see if there should be any hemorrhage or other untoward event. On return of consciousness, vocalization in a whisper was easily effected.

The two parts of the severed thyroid cartilage at the section overrode each other alternately with each phase of the respiration, but it was thought unnecessary to put a suture through them, as it was supposed that the sewing of the skin and compression with adhesive straps would hold them in *situ naturale*. The event proved this to be correct. The wound was closed by five white sewing-silk sutures, supported with adhesive straps, and covered with a dry compress held in place by a bandage. When the patient coughed, air passed out of the opening between the stitches. Put a piece of cork between the teeth to increase the opportunity for the free egress of air. Respiration was easy. The patient was then undressed and put to bed, and the whole operation, from the time of commencing to etherize to the last act, occupied about two hours. 7.30 P. M. Pulse 100; slight headache; deglutition possible but difficult; throat sore on outside, not on inside; patient cheerful; looks well; gave ice, rice broth.

31*st*, 9.45 A. M. Pulse 92; respiration quiet; skin and tongue moist; countenance and spirits good; expression natural; cough very little; wound swelled and sore outside; not much soreness inside; deglutition comparatively easy; some pain in upper part of chest in front; only on coughing does air pass out the wound; not much oozing of serum; gave tinct. veratrum viride gtt. vj, every two hours as a prophylactic against surgical fever. 11 P. M. Comfortable; pulse 92; skin moist; throat sore; coughs but very little.

April 1. Quiet, pulse 80; breathes easily; no appetite.

2*d*, 6 A. M. Removed two or three sutures; I left her in the charge of Drs. Spaulding and Shattuck, and returned home, and Dr. S. subsequently sent me the following diary of the progress of the case:—

"*April* 2, 4 o'clock P. M. Patient very comfortable; pulse 72, rather feeble; wound doing well; had taken but little nourishment; did not like beef-tea; ordered chicken broth.

"3*d*, 10 o'clock A. M. Patient had rather a poor night; sweat on going to sleep; suffered evidently for want of nourishment; had taken nothing during the evening or night; had taken some chicken broth in the morning, and at time of visit was feeling better than any time since operation; wound looking well, removed the remaining suture; occasionally a little air escapes from lower part of wound; pulse 74, good; countenance looking better than since operation.

"4*th*, 10 o'clock A. M. Patient had a good night, slept more than any night since operation; since last visit has taken more nourishment, chicken broth and a little rye paste, with cream, also drank a little porter; set up half an hour this morning; pulse 80, increased a little probably by sitting up; wound looking well; patient looking better than any day since operation.

"5*th*, 2 P. M. Patient had a sleepless night, owing, I think, to *reading* too much the day previous; pulse 80, good; tongue more furred; bowels had not moved for several days; ordered an enema; as the breath continued fetid, gave her chlorate potassa.

"6*th*, 3 o'clock P. M. Found patient dressed and sitting up; had been up considerably during the day; had passed a better night, slept considerably; felt better after operation of injection the previous evening; wound looking well, upper third healed by first intention; but very little air escapes,

and only, if at all, on making the effort to clear the throat, or coughing; breathing very free and easy; phonation quite as good or better than before operation; appetite poor, although she takes more nourishment and is gaining strength.

"*9th.* Patient sitting up; pulse 72, good; tongue coated; no appetite, although feeling stronger, but still quite weak; wound healing well; phonation better. Ordered compound tinct. Peruvian bark.

"*10th.* Patient has been down stairs; feeling stronger; tongue coated; wound healing. Ordered quinia instead of tinct. bark, also fluid magnesia and lemon juice.

"*12th.* Patient down stairs; tongue cleaning; rests better at nights; says she could not talk so well yesterday; was fatigued day previous with visitors; wound almost healed, all except a little space in the middle where I had touched the granulations with nit. silver; no air through wound for several days; rode out half a mile; phonation not quite as good as on April 9th (fourteen days after operation).

"The weather was very pleasant at the time of my visit, and I invited her to get into my chaise and take a ride. She enjoyed the ride much. She is getting along well, but is weak. She was more prostrated before the operation than any one not well acquainted with her might suppose. She is one that does not complain unless feeling very badly. There has been but very little suppuration; the parts look well.

"*17th.* Patient doing well; gaining strength; tongue cleaning; wound entirely closed; tongue quite clean; appetite better, although not very good; rode out yesterday, and walked a short distance; phonation better; feels stronger; is still unable to speak, except in a whisper. I think she will talk better as she gains strength. The skin adheres to the trachea, at the lower part of the wound, so that in swallowing it lifts up the skin. The wound has healed very nicely.

"*24th.* Patient's health is gradually improving. She walks out and rides; made a call on Saturday, and got rather tired. She is not very strong, although she has been taking quinia, pyrophosphate of iron, and porter. She will not be strong enough to visit you for a week or more, I think. Phonation remains about the same, no better than two weeks ago. Breathing seems free. I have not looked into her throat yet. I think her general health was more prostrated previous to the operation than we thought."

May 3. Saw patient at my office. General appearance good; still there is some emaciation and weakness. She sleeps quietly and breathes easily. Says she feels as well as she ever did. Inspection of throat outside revealed a clean, smooth linear cicatrix three inches in length, and in the median line. Upon swallowing there was an evident transverse wrinkling of the skin in front of the neck, due to a small attachment of the skin to the trachea. There was no perceptible projection of one side of the thyroid cartilage over its fellow, and the cartilage felt firm.

Laryngoscopy.—The rima glottidis was small, but not having seen it in health, I could not tell whether it was normal or not in size. Upon the right vocal cord, near the thyroid insertion, was a slight prominence of small size. Colour of cords, reddish. They were symmetrical in movements and divarication.

The aphonia exists, to the disappointment of all concerned. Dr. Spaulding thought that when the patient had rested thoroughly from talking (and he said she had talked a great deal), and had recovered her general

health fully as it was before this difficulty, her voice would return. Once or twice since the operation she has spoken out nearly aloud. Touched the prominence with solid nitrate of silver. Advised cessation from talking, engagement in active and passive exercise, which were adopted.

30*th*. Dr. Spaulding personally informed me that patient is able to speak aloud.

Under date of June 22d, 1866, Miss Jewell writes: "I am talking with a hoarse loud tone, except when I get tired." This resulted after she was advised to use her voice and to employ elementary sounds, the same as a child does when learning to talk.

July 9. Miss Jewell came into my office speaking out in an audible tone. Her voice is peculiar, having a timbre of a puerile character, but still powerful enough and phonic enough to be very satisfactory. She says it is not "her voice." Thinks it improves with time. Laryngoscopy was as difficult as before from the unruly obstinate tongue. Still the vocal cords were plainly seen to be smooth and almost free from excrescence. The rima-glottidis was rather narrow antero-posteriorly, and it was thought that this narrowness would preclude any but a childish voice.

The longitudinal cicatrix has contracted to two and one half inches in length. The general health is not quite so good as might be desired. There is debility and muscular weakness, indicated by getting tired easily. The patient was encouraged to use her voice reasonably with the idea of further development by physiological exercise.

Nov. 19. Under this date Miss Jewell writes, "I am very well," from which we infer that the cure has remained permanent to this date.

Résumé.—The points of interest in the case may be stated as follows:—

1st. The discovery of an organic cause of the aphonia by the laryngoscope.

2d. The modification of Leiter's forceps and the employment of the improvised blunt two-tined table-fork hooks.

3d. The omission of tracheotomy and tube.

4th. The denuding of the three upper tracheal rings, with their membraneous interspaces preparatory to the possible use of the tube subsequent to the operation.

5th. The apparently complete restoration of voice and health which crowned the operation with success, and which appears providential, inasmuch as it was long delayed after all human means had been exhausted, and as several of similar cases have not been followed with such happy results.

ART. XI.—*Gunshot Wound of the Skull; Recovery.* By BENJAMIN H. CHENEY, M. D., of Joliet, Illinois.

ON the 31st day of September, 1865, J. B., a stout and robust farmer's boy, aged 17 years, was out hunting with a double-barrelled shot-gun. He had already discharged one barrel, when, in climbing over a fence, he either caught the hammer in a rail, or, as he himself says, let fall the gun on its breech to the ground with such force that the remaining barrel went off.

His head was at that time directly over the muzzle, and but a short distance from it, and, of course, received the charge.

The patient resides some sixteen miles from this place. When I first saw him, ten hours after the accident, he was lying comatose, with heavy, stertorous breathing, and slow, full, and regular pulse. He manifested a constant disposition to turn the head to the side of the injury, in such a way that the brain protruded from the wound. The left eye was closed from œdematous tumefaction, but the globe was uninjured.

On examination it was found that the whole charge had struck him just at the outer edge of the left superciliary ridge, and had passed directly, upwards, backwards, and inwards toward the junction of the sagittal and coronal sutures, through integument, bone, and brain-substance, carrying away of the latter, as near as could be judged, at least a tablespoonful. The integument was torn entirely away for the space of nearly two inches, and a piece of bone as large as one inch square, but of course very irregular in shape, was also gone. The wound was about three inches in length, extending to the coronal suture. In its track the integument which remained was much torn, and the bone badly comminuted. Two distinct fractures of the skull, radiating from the wound, were visible: one, short and transverse; the other, almost continuous with the track of the wound, and extending further than it could be traced into the left parietal bone. The tissues and integument for some distance around were, of course, very much blackened by the powder.

The hair having been shaven from the vicinity of the wound, a small and entirely detached spicula of bone was removed, and a single suture taken in a somewhat extensive rent of the integument, with a view of lessening the size of the wound, and restraining the brain-substance from protrusion. Beyond this, the only treatment adopted was the application of cloths wet in cold water, and the direction that the head should be kept propped by pillows in such a way as to prevent the patient from turning it to the left side. Directions were also given to feed the patient with a proper allowance of essence of beef, animal broths, &c.

Some three weeks later, at which time I supposed either that the case had terminated unfavourably, or that medical advice from one of the towns nearer the patient's residence had been sought, the father presented himself, and informed me that the boy was fast recovering, and had, during that week, recognized his family and friends. No treatment other than that mentioned above had been instituted. Suppuration had taken place extensively, and the wound was healing kindly. A few directions regarding quiet, avoidance of excitement, diet, and the regulation of the bowels were given, and dry cloths ordered in place of the wet ones, which were still being used. No other change or addition was made to the treatment.

On the 8th day of June, 1866, the boy himself called to see me. The wound had entirely healed; the cicatrix being about three inches in length, and of a size and depth to readily accommodate the index finger. The pulsations of the brain under the tissue of the cicatrix could be distinctly seen at a room's length from the patient.

Some points in his physiological condition at this time are of interest. The patient's general health had been very good since his recovery, so much so that he had been at work ploughing and sowing during the spring, had been out hunting again, &c. A singular feature was that his appetite when he was *not* at work was excellent, and he ate his full ration

with the others who were performing their usual daily labour. But on the days when he worked, he had no appetite whatever. There was no nausea or loathing, but simply a positive disinclination for food (anorexia), so that he could take nothing unless it was to "sip a little tea, or take a bite of toast." Probably some disturbance in the equilibrium of the circulation in the encephalon, induced by the active exercise of work, and consequent upon the loss of brain-substance, was the cause of this condition.

The patient also found the locality of the wound very susceptible to the influence of temperature, and was obliged, for comfort when he went out, to wear a silk handkerchief over the cicatrix, and to pull his hat down over the left eyebrow. When he stepped down from one height to a lower, even a slight distance, he felt a perceptible jar in the head. Otherwise he experienced no discomfort from the injury.

Not the least interesting were some of the effects of this injury upon the brain as the instrument of mental manifestations. Previous to the accident the patient had been able to read and write, had studied arithmetic, &c., and was accounted among his neighbours bright and intelligent. Since his recovery it was found that he had forgotten all these. He could not even read simple monosyllabic words. He knew some of the letters of the alphabet by name, but evidently connected with them no phonetic sound. For example, when I asked him if he could not spell such words as "cat, dog, &c.," he replied that he "could sometimes, but did not know why." His success in certain cases seemed to depend either upon chance, or upon some reminiscence or association wholly distinct from a conclusion arrived at from the sound of the letters. To him c-a-t might as well spell *tree* or *elephant* as anything else. He seemed equally unable to deduce conclusions from given premises, or to connect cause with effect even in the most trivial cases. His memory was distinct in proportion as the events were recent. He well remembered all the incidents of the accident, and things that had taken place just before. Events, however, dating years back were vague, and, to some extent, dream-like in his mind.

The faculties of perception, memory, and reproduction (recollection), remained in certain degrees, their strength being in the order here given, while nearly all power of elaboration or comparison seemed gone. The latter faculty (the elaborative, or power of comparison, including judgment and reasoning), is classed by Sir William Hamilton as the highest state of the mind. For its exercise, therefore, a full quantity and due equilibrium of the brain is necessary, while other facultaties can be exercised to some degree with less and under different conditions. As an injury of this kind may be, to some extent, an exponent of certain pathological conditions of the brain, imperceptible, save in their mental manifestations, so does it also, so far as it goes, afford ground for the presumption that the order of the intellectual faculties, usually given by philosophers, has a physiological as well as a psychological basis.

TRANSACTIONS OF SOCIETIES.

ART. XII.—*Summary of the Proceedings of the Pathological Society of Philadelphia.*

March 14. *Constriction of Ileum by Appendix Vermiformis.* Dr. Thos. H. ANDREWS exhibited the specimen and read the following report:—

John Hagy, æt. 55, native of Ireland, labourer, was admitted into surgical wards of Pennsylvania Hospital Tuesday, March 6th, 1866, with, as he said, a rupture of the left side. The history which he gave was as follows:—

The tumour first made its appearance about five years ago, being produced, as he said, by heavy lifting and straining. The tumour was small at that time, and there existed but very little pain, causing him no material inconvenience; it was easily reduced, but in consequence of his never wearing a truss the bowel remained down constantly, excepting whilst he was in the recumbent posture.

His condition remained the same up to within one year ago, when he began to experience trouble and pain at the time of reduction. Last four or five weeks the trouble has increased, the pain becoming more aggravated, tumour harder in consistence, and remains down all the time, both sitting or standing up, and lying down.

About eleven days before his admission into the hospital, the pain has been almost insupportable; the tumour more sensitive to the touch; complete loss of appetite; and what little he was able to eat was vomited soon after; last day or so vomiting has been incessant, which vomit consisted of a yellow fecal-like substance. The pain now extends throughout the belly; has been seven days since he has had a passage.

On admission, he was in a very debilitated condition. Pulse was not very frequent, but feeble and compressible; tongue coated with a yellowish coat, with reddish edges and tip; countenance anxious; peculiar drooping of the left eyelid; pupils somewhat contracted; sunken features; clammy skin; heart sounds feeble.

On a physical examination of the parts we found a tumour, about the size of an English walnut, more oblong in shape, just over the left external inguinal ring and spermatic cord, and just above the left testicle; on compression it gave to us a peculiar crackling sound, which sound is said to be, by some authorities, indicative of inflammation of the hernial sac; it also had a peculiar feeling of hardness, which, upon applying pressure, appeared to leave an indentation. He informed me that many attempts at reduction had been made before his admission into the hospital, but without success.

I ordered for him a warm bath, then made an attempt at reduction whilst in the tub, but was unsuccessful.

After being placed in bed, I ordered for him forty drops of laudanum by enema, and then sent for the attending surgeon, Dr. Agnew.

On his arrival, the tumour was cut down upon, the different layers successively taken up and divided, until we arrived at the sac; the adhesions that surrounded the sac were very hard, evidently of long standing. Upon cutting into the sac it gave vent to about one drachm or two of fluid, but no bowel was there; the finger could be passed into the sac, up through the inguinal ring into the abdominal cavity, and come in contact with the bowel; now it remained a query whether the symptoms of strangulation of the bowel which existed in him were caused by trouble at some other point, either near or distant, or that the bowel supposed to be strangulated had been reduced by the taxis either before or after his admission into the house, and the sac which contained the bowel had, in consequence of its firm adhesions and distended appearance (both from its thickened walls and containing fluid), given to us the appearance of non-reduction.

Again, the walls of the sac were cut loose from the surrounding attachments, and a ligature thrown around its constricted portion and the remainder cut off. Wound was brought together by ordinary interrupted suture—very little hemorrhage during operation, but one ligature was required.

A tent was inserted in order to secure union from the bottom, then a compress and bandage (spica), &c. An anodyne was immediately ordered; also 1 gr. opium pill every second hour during night, and in consequence of his depressed state milk punch, a wineglassful every second hour.

Wednesday, March 7th, 8 A. M. Passed a very restless night; did not suffer much pain, but the vomiting of the peculiar yellow matter still continued. Pulse feeble, 112; temperature in axilla 101½°.

12 M. The pain has increased, and the swelling and tenderness also augmented, for which he was ordered a blister eight by sixteen over abdomen. Tongue moist, but coated heavily with a yellowish substance somewhat resembling starch; pupils contracted; conjunctivæ congested; says he feels more comfortable since the operation; wound undisturbed.

6 P. M. Pulse still very feeble, 103; temperature 101¾°; symptoms remain about the same; still vomiting.

Thursday, 8 A. M. Pulse feeble, 112; temperature 100°; vomiting continued through the night; no increased swelling or tenderness of belly; he complained of feeling full, wanting a passage, for which he was ordered an injection, which was of no benefit; the fluid could not be retained; as soon as syringe was removed it came out with a rush, containing little or no feces, and the piston, if left alone, is pushed by fluid injected; this made us think there was some intestinal obstruction.

6 P. M. Pulse 108; temperature 100°; no marked change.

Friday, 8 A. M. Pulse very feeble, 108; temperature 101°; great increase of pain; no increased swelling; wound looks well, but little discharge, quite healthy in appearance; hands and feet cold; tongue still heavily coated; anxious expression, Hippocratic; pupils very much contracted; vomiting still continues and did throughout the night; medicine affording no relief; heart sounds feeble; left eye lost its glassy appearance, a film over it; constant tossing from one side to the other, as if in great pain; skin shrinking, approaching to cutis anserina. Ordered morph. sulph. gr. ⅛, with hyd. chlor. mite gr. ⅙ every hour.

5 P. M. Pulse not perceptible in wrist and scarcely in the axilla, 56; temperature 100½°; respirations shallow and frequent, 40 to 48; extremi-

ties still very cold; constant groaning and tossing about; increased swelling in belly; great thirst; vomiting incessantly; heart sounds scarcely perceptible, but slight expansion of the lungs; passed catheter, no urine in bladder; skin livid; evinces pain on slightest touch, in fact, on the approach of any one; features sunken. 6 P. M. Moribund.

Death twenty minutes past six, Friday, March 9, 1866.

Autopsy three hours after death.—Peritoneal investment of intestine minutely injected and very dry, but sticky from slight exudation of coagulable lymph. No appearance of any part of the bowel having been strangulated in a hernial sac. The adhesions of intestine to iliac fossa and elsewhere were thick and tough, and at one point on left side of pelvis above the obturator foramen a loop of ileum was adherent. The small intestines were distended with light yellow fluid feces down to within four inches of the ileo-cæcal valve; below that point, it and the whole large intestine were greatly contracted. This constriction was caused by an adhesion formed between the end of the vermiform appendix, which was twisted back and to the left, and a loop of the ileum. This adhesion, one-third inch thick and one-half inch long, bridged the ileum four inches above the valve, so as to compress it against spinal column and completely occlude it. The mesentery was thick and hard, and the mesenteric glands enlarged and firm.

March 28. *Cancer of the Stomach with Latent Symptoms; similarity to Cirrhosis of the Liver; with Remarks on the Temperature of the Body in Cancerous Affections.* Dr. DA COSTA read the following:—

P. F., æt. 52, born in Ireland, and a labourer occupied in picking slate and carting dirt outside of a mine in Schuylkill Co., was admitted into the Medical Ward of the Pennsylvania Hospital, on the 31st of January of this year. He was one of those stolid and somewhat stupid persons, from whom it is difficult to obtain a connected and intelligible history of their ailment; but questioned closely several times, he stated that he had enjoyed good health up to four weeks previous, when he was troubled with pain and soreness in the supra-pubic region, and a pain in the left hypochondrium. He attributed these pains to the constant bending over in picking slate, and as regards the pain in the left side, at least, declared that it had gradually worn away. Shortly after the uneasy and painful feelings in the abdomen were noticed, he became aware that his feet and legs were swollen. For a few days this swelling disappeared in the mornings, and particularly after using frictions, but subsequently it became permanent, and then tumefaction in the abdomen attracted his attention. Very shortly afterwards he observed that the quantity of urine he passed was decreased; and that the urine was high-coloured and burned in passing.

The man was of small stature and rather thin; and the dropsical effusion was not confined to his lower extremities and abdomen. A note of his condition, taken on the 2d of February, shows clearly that thoracic dropsy formed part of the general anasarca. The note says: "Skin dry, and slightly heated, not icteroid; conjunctiva dull, not yellow; pulse 84; tongue moist, and coated with a thin, yellowish fur, particularly in the centre; appetite impaired; one or two passages daily, which are stated not to be loose; some nausea, but no vomiting; a sense of fulness, but no pain in the abdomen, nor was there tenderness. The abdomen is moderately distended; fluctuation distinct. The hepatic dulness does not fairly

extend to the lower margin of the ribs, where resonance is discerned. The feet are markedly œdematous, but not the upper extremities. An examination of the chest shows a very decided bulging on the left side; not, however, in front; rather laterally, from the left axilla downwards. But both laterally and in front, there is decided dulness on percussion, which is also elicited posteriorly; though the line of dulness there is on a much lower level than that in axilla. The dulness in front does not extend to clavicle, scarcely above the third rib. Respiration is very feeble, laterally and posteriorly. The impulse of the heart is feeble; the sounds extremely so, especially the first sound, which at apex is barely audible. The cardiac percussion-dulness, so far as the effusion in the pleura permits us to judge, is increased; and this is attributed to co-existing pericardial effusion. There is slight cough; no expectoration. The urine has a sp. gr. of 1020, is acid, contains no albumen." The man was placed on low diet; iodide of potassium, 5 grains three times daily, was given; iodine was painted over the chest; and the kidneys were acted upon by an infusion of juniper berries. Counter-irritation over the hepatic region, by means of iodine, was also directed. But little if any improvement took place under this treatment. Indeed, as on the 8th of the month, the patient was troubled with diarrhœa, having from four to six loose passages daily, the iodide was suspended, and small doses of paregoric were occasionally given to keep the diarrhœa in check; though no attempt was made to stop it entirely, as it evidently relieved the abdominal tension and swelling. The juniper berries acted freely as a diuretic, and were kept up for a considerable time. The iodide of potassium was twice resumed, and administered for a week at a time, but it evidently did not suit him. On the 12th of the month, and prior to the iodide being resumed, many rales in his chest and a severe cough, indicated an expectorant, and a mixture of squills and compound liquorice mixture was chosen. The cough was much ameliorated, and it and the expectoration gradually ceased, while the rales passed away. Subsequent to this he was placed on Basham's diuretic iron mixture, and all other medication was stopped.

Such, in a few words, was the treatment in the main pursued. And during its continuance for six weeks no very striking change took place in the more prominent symptoms. There was always more or less tendency to looseness of the bowels. The dropsy diminished somewhat, and particularly did the pericardial effusion change; for from the 5th of March on, note after note reiterates the statement of decreasing dulness in the præcordial region, and increasing distinctness of the heart sounds. The effusion in the pleural sac lessened; but much œdema of the legs and feet remained. The tongue was clear, and red, and fissured; the abdomen distended, not tender to the touch anywhere; the circulation in the abdominal walls appeared to be normal, and the veins were distinct and somewhat prominent, though by no means to a very marked degree. The spleen was not large. On March 8th, the evening temperature, as measured with a thermometer in the left axilla, was 99¾° Fahr. with a pulse of 96, and respirations 20. Neither then, nor until the patient's death on the 26th of March, was there hectic; the thermometer always marked under 100°. But though no hectic, there were steadily progressing emaciation and debility. His pale, unimpressive face became more and more wan, perhaps of slightly yellow tinge, and he seemed to be fully impressed with the idea that he was not doing well. Yet his appetite

remained fair; there was some nausea; but no vomiting, acidity or fetor of breath, delayed digestion, or any special gastric disturbance occurred. Nor was there abdominal pain, if we except attacks of colicky pain which in the last weeks of his life, certainly in the last week, came on very constantly, particularly in the evening, and being referred to the lower part of the abdomen which then felt hard and tense, and yielding very readily to small doses of paregoric and lavender, were attributed to flatulent distension of the bowel. The stools were rather light-coloured and of softish consistency. The urine, several times examined, showed when tested with nitric and sulphuric acids, the presence of bile pigment. No peculiar symptom preceded his death; he died from exhaustion, and somewhat unexpectedly; for though he remained for the most part in bed, he was able to be about the day before, and death certainly did not appear so near at hand.

Autopsy, ten hours after death.—Body much emaciated; abdomen prominent. *Left pleural cavity* contained three pints of yellowish serum. Lower lobe of left lung collapsed, and bound to diaphragm by strong old adhesions, and less firmly to lower part of costal pleura. Upper lobe crepitant, but attached at lower edge to the opposed surface of costal pleura; the apex of the lung was also adherent. On the right side of the chest were found a few old adhesions, but no effusion existed. Both lungs highly pigmentary. The *heart* much smaller than normal; the pericardium was loose, and on its cardiac surface was a dense white spot, about one inch in diameter. The pericardium contained somewhat over an ounce and a half of fluid. The ventricles were of normal thickness and dimensions as compared with the size of the whole heart; the left ventricle contained a clot.

On opening the abdomen two quarts of a yellowish serum, without flocculi of lymph, were evacuated. The liver scarcely reached to the margin of the ribs; its lower edge was thin and the entire organ small, as indeed were all the other viscera. It weighed rather above three pounds, was of a very dark reddish-brown, and its consistence somewhat increased, though it could be torn. It exhibited a granular section, but nothing to the naked eye like the appearance of cirrhosis. Its capsule was much thickened and tightly adherent to the diaphragm, and to the liver structure itself. Gall-ducts pervious; gall-bladder contained a small amount of bile, but no stones. *Spleen* normal; tightly adherent to fundus of stomach, and imbedded in thickened peritoneal folds, though its own capsule was not materially altered. *Kidneys* small and anæmic. *Supra-renal capsules* healthy. *Bladder* full of pale urine, but healthy.

Neither the *stomach* nor *intestinal folds* were visible on opening the abdomen, being agglutinated into three masses, each covered anteriorly by a thick, shining, whitish membrane. On dissecting this off no gastrocolic omentum was found; the stomach was tightly adherent to the colon, the central portion of which could be recognized through the thickened peritoneum which covered it. The stomach when inspected, as it lay underneath the dense white structure, looked like a smooth, non-nodulated mass. It was tightly adherent, the adhesions forming part of the mass, to the under surface of the left lobe of the liver, as far as the transverse fissure and the portal vein, the hepatic artery, as well as the duct being involved in these dense adhesions. The duodenum was less united to surrounding structures than were other portions of the intestinal tract. The pancreas was perfectly healthy, and strongly adherent to the stomach. There were also along the lesser curvature of the stomach and at its

fundus near the spleen several hard whitish glands, varying in size from a pea to a hazlenut. All these structures and adhesions formed the upper of the three masses. The second was composed of the cæcum and lower part of ilium agglutinated by tenacious adhesions and covered by the whitish membrane above described; the third mass was composed of the sigmoid flexure of the colon and the remaining portion of small intestine similarly adherent and covered.

On laying open the *stomach* it was found to be much contracted, measuring, as ascertained by Dr. William Pepper, only five inches from fundus to pylorus, and three from cardia to corresponding point on greater curvature. Its serous coat was so adherent to the thickened membrane as to be inseparable, and, indeed, constituted part of it. All the succeeding coats, excepting the mucous, were converted into a dense uniform mass, having a whitish scirrhous appearance. This morbid structure varied in thickness from one-fourth to half an inch, with the exception of two masses along the greater curvature, which encroached upon the cavity of the organ, and measured in thickness about an inch and a quarter. The abnormal condition of the walls was gradually lost, as the cardiac and pyloric orifices were approached, and these orifices were perfectly pervious and not in the least contracted. The mucous membrane, properly speaking, existed only for half an inch around the cardiac orifice, and about an inch and a half around the pyloric; in the latter portion it was highly rugous, conveying the impression of being hypertrophied. Nowhere was the mucous membrane ulcerated, but its normal appearance was obliterated at all parts except the extremities of the organ mentioned, presenting to the eye a uniformly whitish, dense, smooth membrane, wholly unlike the irregular, yielding look of the mucous coat of the viscus in health, and without any granular depressions.

The *intestine*, as already stated, was agglutinated throughout its entire extent, so that the most careful dissection was requisite to separate the folds. The intestine was contracted in all parts except the duodenum; the coats in the small intestine, with exception of the peritoneal, appeared healthy. In the large intestine the submucous tissue was in portions thickened and dense, presenting, though to a much less degree than in the stomach, a scirrhous appearance. The mucous membrane of the small intestine looked healthy, there being no enlargement of the solitary glands or of Peyer's patches. In the large intestine, however, towards the cæcum, one or two irregular ulcerations were perceived, about half an inch in diameter, with depressed edges, and having the submucous tissue for their base. Scattered over the mucous membrane were thrush-like bodies of grayish floccular look, roundish or stellated in shape, varying in size from a pin's head to a small bean, and moderately adherent to the mucous membrane, which under them was superficially ulcerated. Similar bodies were found on laying open the œsophagus. The mesenteric glands were not enlarged.

Microscopical examination.—Sections of the *liver* examined microscopically, exhibited liver cells of normal size, and very granular. Most of the granules were like brownish pigment, and evidently discoloured by bile. The granular masses noted as discernible to the naked eye, consisted of cells which were pre-eminently discoloured, and displayed the appearances mentioned. In no field was there free fat.

Sections from the thickened wall of the stomach, those portions which presumably corresponded to the submucous coat presented a cancerous structure of extraordinary distinctness; large cells with several nuclei and

clearly defined nucleoli abounded; and instances of cells containing five or more large nuclei were not uncommon. The rugous portion of the mucous membrane found in the neighbourhood of the pylorus, showed no increased fibrous tissue; it was in parts granular, and some of the cancerous elements had here and there commenced to invade its texture. Its glandular structures did not appear to be altered; yet no sections having particular reference to the glandular apparatus were made. At other parts of the stomach the smooth dense texture which occupied the seat of the mucous membrane, exhibited in sections taken from its uppermost surface, only here and there some remnant of the composition of mucous tunic, but more generally much fibrous tissue, and very granular fields with cancerous elements shining through, and evidently placed beneath.

The small glands surrounding the stomach were markedly cancerous; in the granulations in the peritoneum and outer intestinal walls were also discerned round or ovoid cells, with large distinct nuclei, and even nucleoli, delicate, and finely granular. These cells were much larger than exudation corpuscles, and were not found in anything like the abundance they were in the gastric cancer. Indeed, the mass of the intestinal granulations and thickening was composed of fibrous tissue. The thrush-like bodies within the intestine presented a very peculiar constitution. They consisted for the most part of free granules, a degenerate cell structure of small, granular cells, and a fibrillated, but not a fibrous membrane. In one specimen this fibrillated structure abounded, and the small, granular cells were arrayed in loops and bunches, an attempt at a villous formation, in which, moreover, a very little, loose fibrous tissue was merged. The cells which entered so largely into the construction of the thrush-like bodies, were not only very granular, but indistinctly, or not at all nucleated, and utterly unlike those found on the outside of the intestine, or in the walls of the stomach. They were evidently not the cells of a cancerous growth. But besides them could be seen in three or four specimens examined, a few delicate, round or ovoid cells, much larger, nucleated, and of a tint and size corresponding to the free nuclei of the cancerous portions of the stomach. Three of these nuclear bodies were inclosed in one cell; while a few other cells had one or two. Indeed, it seems not to admit of doubt, that cancer was commencing to appear in the thrush like formations.

The case just detailed presents, both pathologically and clinically, a number of striking and singular features. The precise seat of the cancerous growth in the stomach; the unoccluded orifices; the complete absorption of mucous membrane, excepting over a small surface of the organ; its contracted size; the firm adhesions to surrounding structures; the limitation of the malignant disease in the intestines to large segments; the thrush-like bodies in the digestive tube; the extensive one-sided pleuritic effusion; and the luxuriant cell-growth in the cancerous stomach, so unlike the usual microscopical features of gastric cancer—are points of decided pathological interest.

But still more interesting, certainly more anomalous, are the clinical bearings of the case. When we reflect that the malady had so obscure an origin, and that throughout its course it continued so latent that not a sign ordinarily belonging to cancer of the stomach was encountered: when, in other words, we look for the symptoms of disordered gastric function and failing health, so generally preceding the full development of malignant disease of the stomach; or inquire into the existence of

fetid breath, acid eructations, vomiting after meals, ejection of glairy-mucus or coffee-ground material, containing a varying amount of blood; or seek for the evidence of pain, constant and commonly aggravated by food, or of a tumour at the upper part of the abdomen perceptible to the touch; when, then, we contrast these phenomena with those actually present, or, to speak more accurately, note their almost entire absence, —we perceive how strange an illustration of a fatal malady was before us, and have one more instance added, showing how seriously a vital part of the economy may be diseased, without ever betraying its disease. The post-mortem results tend to explain the singular character of the symptoms; for in the diminished orifices, in the small size of the stomach, with its smooth exterior, its firm adhesions, its distance from the abdominal surface, in a part of the gastric mucous membrane remaining intact, nay, apparently being hypertrophied, in the unaffected duodenum, in the coexistence of cancer at other parts of the intestine, we find the main reasons for the kind of digestive disturbances which the case presented. And this record proves how very much more the manifestations of cancer of the stomach are the consequence of the exact seat of the cancer, and of the extent and nature of the destruction of the mucous membrane, than of the mere existence of the malignant disease.

But the case I have detailed did not only not resemble the affection the autopsy proved it to be, but it simulated in the closest manner a disease of a different viscus. This case of gastric cancer had all the traits of cirrhosis of the liver. It occurred in a spirit drinker; there was the dropsy, with the sense of fulness in the abdomen, with the small extent of percussion dulness in the hepatic region, with rather frequent stools, and these towards the last, pale, with the earth-coloured hue of countenance, with the gastric symptoms not more marked than they usually are in cirrhosis, and even with the presence of bile-pigment in the urine. True, the emaciation was taking place more rapidly than usual in cirrhosis, and the debility was greater; but the presence of so much fluid in the pleura and pericardium, and the state of the bowels, more irregular than ordinarily in cirrhosis, might have been urged to account for this. The only symptoms not those of cirrhosis were, that no granulations could be felt through the abdominal walls, that the spleen was not enlarged, and that the abdominal veins were not greatly distended. But to any one who has examined cases of cirrhosis, it is needless to say that to the first sign no importance can be attached; and that neither the second nor the third is constant.

In conclusion, there is one more feature of this case to which I shall call attention; and it has a significance far beyond this individual case. I have stated the temperature of the body to have been below 100° F., notwithstanding the progressive and rather rapid wasting. It is known that in tubercular disease the thermometer indicates a heat much higher —a fever temperature. Shall we find it the rule that cancerous affections show a comparatively low temperature? If so, many a doubtful differential diagnosis between cancer and tubercle of internal organs will cease to be doubtful. I have thus far four observations bearing on this point. In a case of cancer of the liver, under my charge at the Pennsylvania Hospital, and which terminated fatally, the evening heat was never but a fraction above 99°; in a case of cancer of the mesenteric glands, of which the temperature was taken carefully by one of our members, Dr. Edward Smith, it did not exceed 98°; in another case of internal cancer it did not reach 100° Fahr.

REVIEWS.

ART. XIII.—*Anæsthesia.*

1. *Chloroform: its Action and Administration. A Handbook.* By ARTHUR ERNEST SANSOM, M. B. Lond. London, 1865. pp. 192.
2. *On the Safe Abolition of Pain in Labour and Surgical Operations by Anæsthesia with Mixed Vapours.* By ROBERT ELLIS, Surgeon-Accoucheur. London, 1866. pp. 80.
3. *On Stimulants and Narcotics: with Special Researches on the Action of Alcohol, Ether, and Chloroform on the Vital Organism.* By FRANCIS E. ANSTIE, M. D., M. R. C. P., Assistant Physician to Westminster Hospital, Lecturer on Materia Medica and Therapeutics, etc. London, 1864. pp. 488.
4. *A System of Surgery.* Edited by T. HOLMES, M. A. Cantab. Vol. III., Art. "Anæsthetics," by JOSEPH LISTER, Esq., Professor of Surgery in the University of Glasgow. London, 1862.
5. *Traité d'Anesthésie Chirurgicale.* Par MAURICE PERRIN, Professeur agrégé à l'Ecole impériale de Médecine et de Pharmacie militaires, Lauréat de l'Institut, Chevalier de la Légion d'Honneur, etc. etc. etc., et LUDGER LALLEMAND, Professeur agrégé à l'Ecole impériale de Médecine et de Pharmacie militaires, Lauréat de l'Institut, Chevalier de la Légion d'Honneur, etc. etc. etc. Paris, 1863. 8vo. pp. 668.
   A Treatise on Surgical Anæsthesia. By MAURICE PERRIN and LUDGER LALLEMAND.
6. *Nouveau Dictionnaire de Médecine et de Chirurgie pratiques.* Tome deuxième. Art. "Anesthétiques généraux," par J. GIRALDES. Paris, 1865.
   New Dictionary of Practical Medicine and Surgery. Art. "General Anæsthetics," by J. GIRALDES.
7. *Das Chloroform. Eine Zusammenstellung der bisher über dasselbe gemachten wichtigsten Erfahrungen und Beobachtungen, vorzüglich in physiologischer und medizinischer Beziehung.* Von Dr. FRIEDRICH SABARTH. Würzburg, 1866. 8vo. pp. 276.
   Chloroform. A Collection of the most important Experience and Observations made up to the Present Time. By Dr. FRIEDRICH SABARTH.

TWENTY years have elapsed since the discovery of anæsthesia brought into the world of reality what had before existed only in the fancy of the poet—a "borrowed likeness of shrunk death," producible at will, and of temporary duration. How unexpected was the achievement may be known from the fact that, only a few years before it was made, the leading surgeon of the world spoke of it as a chimera the pursuit of which was abandoned.[1] Yet, in fact, like many other discoveries in science and in art, it was the

[1] "Eviter la douleur dans les operations est une chimère qu'il n'est pas permis de poursuivre aujourd hui."—VELPEAU, 1835; from KIDD'S *Manual of Anæsthetics*, London, 1859.

result of long-continued and patient efforts made by many persons, and not accidental, but the termination of a pursuit carried on for years, with the definite end in view which was afterwards attained. The discovery found, too, a profession, if not a world, ready to receive it; its spread was as rapid as the transmission of news; and it may truthfully be said that the patient, whose agonies it annihilated, did not give it a heartier welcome or receive it with a more profound thankfulness than did the surgeon, who saw his feelings of humanity spared, while his operations were aided and the field of his usefulness extended.

The twenty years since the discovery have not passed without progress. The first success was not final; another and more powerful agent was soon discovered, and has almost entirely supplanted the one first used; several others have been introduced, experimented with, or used for a time, and abandoned. More powerful than all else to stimulate inquiry has been the shadow which soon came to darken the lustre of a discovery which, it would seem, might otherwise have been too perfect for our conditions here. Death was found sometimes to occur during the process of anæsthesia—sudden and unexpected death. The patient who sought relief from temporary pain found the termination of existence, and the surgeon was horrified at seeing his attempt to alleviate end in destruction. This sad fact has been the cause of more experiment and investigation than all else connected with the subject, and although certainty may not yet have been attained—although opinions have differed widely, and still differ, as to the circumstances which cause or favour this sad occurrence—the results have been a better acquaintance with the agents employed, clearer views of the sources of danger, and more certain rules for safety in their administration.

The work of Snow, which appeared in 1858, seemed to mark a period in the literature of anæsthesia. His views were so ably presented and supported by so much clinical experience, and his work was so complete a treatise upon the subject, that the profession generally accepted him as authority, and for some years his work and doctrines were sole occupiers of the field. But the brief space of time since then marks a wide interval of progress and research; our knowledge has been much increased; opinions have changed; and within a few years many works have issued from the press to give expression to them. The titles of some of these we place at the head of this article, and will briefly indicate their aim, scope, and general character, while we will try to gather from their pages the latest information and give the most reliable decisions upon some of the more important questions connected with anæsthesia and anæsthetics.

The work of Dr. Sansom may be characterized as most excellent. Written not alone from a theoretical point of view, but showing very considerable experimental study and an intimate clinical acquaintance with the administration of these remedies—passing concisely over the whole ground, giving the latest information upon every point—it is just the work for the student and practitioner. The author may rest assured that although in his preface he objects to the "hackneyed expression of 'endeavouring to supply a want,'" this is just what he has done—supplied, and well supplied, a want, for no such book existed before in our language. That he has "expended much labour in its compilation" is evident throughout, and we are certain that he has succeeded in his endeavours "to combine the characteristics of truth and brevity."

The work of MM. Perrin and Lallemand is a complete and exhaustive treatise upon the subject. With less of personal clinical experience, per-

haps, than might have been wished, the work contains chapters upon every subject connected with anæsthesia, from a thorough history of the discovery, with a critical examination of the merits of rival claimants for the honour, to a full consideration of what has only so recently attained practical realization—local anæsthesia. The chapters upon the physiological action of ether and chloroform are especially full; there is a complete list and full report of all the sudden deaths during administration of either agent which had been reported up to the time of publication; every theory advanced upon the nature or cause of this sad accident is given and thoroughly examined; finally, the application of the remedies to all the various operations of surgery and to obstetrics is fully considered.

It would seem scarcely possible that in these days of international communication such a work as this, upon such a subject, could escape observation and comment during several years. Yet such is the fact. We do not remember to have seen even a notice of this work in any medical journal, either foreign or domestic. Nor is this all; in all the works upon chloroform we have thus far perused we have not found an allusion to, nor an extract from, the book. What makes this more passing strange is the fact that these authors, with an associate, Duroy, have published a work[1] devoted to an exhaustive examination of the physiological action of these and similar remedies, and the doctrines advanced in which have given rise to no small amount of controversy among writers upon physiology and anæsthetics, and it is therefore referred to and quoted from very frequently in every work upon these subjects! So singular a fact we cannot fail to mention, while to explain it is impossible.

The present work bears upon its title-page the names of Perrin and Lallemand. A fly-leaf follows, and informs the reader that during the preparation of the volume M. Lallemand was called away to the post of "médecin en chef" of the French expedition to Mexico; that but a short time elapsed before "a glorious death came to change the sorrows of absence into eternal regrets." The publication would then have been abandoned, "had not the presentation of common researches and of ideas which had been cultivated together" appeared to his colleague "as a sacred debt which was owed to his memory, as a pious homage to be rendered to his friendship."

Dr. Sabarth's work follows very closely the design expressed in the title-page; it is a collection of the writings of others, rather than an original work. As affording a ready reference to the views of those who have written upon the subject, and especially as gathered from medical journals often inaccessible, it is valuable; but it lacks the impress of individual opinion, and a running commentary upon opinions advanced, often conflicting, cannot possibly assume the character of a scientific treatise. It passes very completely over the whole subject, and shows evidence of great industry in the collection of material from widely different sources.

The little volume of Dr. Ellis has been written with two objects in view: the demonstration of the practical utility of mixed vapours for anæsthetic purposes, and the introduction to the profession of a special inhaler, designed by himself, for their administration. It is an admirable little work, from the scientific spirit which animates it, and the judicious and moderate tone of expression which pervades it. He has worked long and faithfully

[1] Du Rôle de l'Alcool et des Anæsthétiques dans l'Organisme. Recherches expérimentales. Par Ludger Lallemand, Maurice Perrin, et J. L. P. Duroy. Paris, 1860.

at the subject by actual experiment, especially to learn the different rate of evaporation of alcohol, ether, and chloroform when combined, and his inhaler is a very ingenious piece of mechanism. The instrument and his mode of anæsthesia he claims to be particularly adapted for natural labour, for which they were designed. Upon one point the author deserves the greatest praise: having a special plan and instrument to present, he has not sought to build up a reputation for them by pulling down that of others. Regretting the accidents which sometimes follow the use of chloroform, he acknowledges they are very few indeed; and firmly believing in the superior safety of the mixed vapours, he does not exaggerate the danger of the pure article, or try to bring it into disrepute. In this respect he escapes a grave mistake made by Dr. Arnott in his advocacy of local anæsthesia by cold.

Dr. Anstie's work, so far as his doctrines in regard to stimulants are concerned, was fully reviewed in a late number of this journal. Only about one hundred pages of the volume are taken up with ether and chloroform, and this chiefly in regard to their physiological action. He is an original worker and independent thinker; his opinions and conclusions are valuable, and cannot be neglected in any view of the present condition of the subject.

Of the articles in the *System of Surgery* and the *Dictionnaire* we need only say they are worthy of a place in what may be called these national representative works. In both the subject of anæsthesia is briefly but most ably considered, and with direct reference to the demands of every-day practice.

We shall occupy but brief space with the history of the discovery of anæsthesia and the agents by which it is produced. One or two points demand brief mention. Thus, the French claim for Flourens priority of discovery of the anæsthetic properties of chloroform upon animals, an honour which is universally accorded to Simpson by English writers, although Sansom speaks of "certain observations" on this point communicated by the celebrated physiologist to the Academy of Sciences of Paris, in March, 1847.[1] At any rate, Flourens' observations bore no practical fruit, and are but another of those instances which excite our wonder at the near approach made to great results without attaining them. To render him justice for his discovery, however, is not to detract from the honour due to Simpson, whose personal daring in experimentation with the vapour, and his merits in verifying the efficacy and safety of its use, are beyond all praise. Rich and lasting as time, too, will be his reward. Often has it been impressed upon us as we have heard in some lonely cabin in the forests of a distant western State whose inmates never heard his name, a hearty "God bless the man who invented chloroform" coming from a heart overflowing with thankfulness for suffering abolished.

Upon one point, and one only, are we obliged to find fault with Dr. Sansom, and it is in connection with the history of the discovery. It is the entire omission of any mention of the first surgical operations in this country under ether.

"A man named Frost had a tooth extracted under the influence of sulphuric ether, absolutely without his knowledge of the operation, on the 13th of September, 1846.

[1] The reference in Perrin's work is to *Comptes Rendus de l'Académie des Sciences*, 1847, tom. xxiv. p. 342.

"The boon was too great not to be recognized. The news was brought to England, and ether was immediately employed for surgical operations by Mr. Liston and Mr. Fergusson."

This is all! Not a word of the operations at the Massachusetts General Hospital by Warren and Hayward! Surely this was not ignorance on the part of the author, but could only have arisen from carelessness. Certainly, for the honour of our country, we could not let it pass unnoticed.

The decision of foreign writers as to the controversy between Jackson and Morton for the honour of the discovery cannot but be of sufficient interest to deserve a place here. Giraldes briefly alludes to the long controversy before Congress and the Medical Society of Boston, into the examination of which he cannot enter, and says "the honour was accorded to Dr. Morton." The following is Perrin's decision, which seems to be assented to by Sansom:—

"Jackson first placed beyond doubt this capital fact, that general insensibility is one of the constant effects of ether upon the organism; he recognized besides that this insensibility could be obtained in a very short time, that it disappeared rapidly, and that it was not accompanied by the dangers which had been attributed to it. But these fundamental discoveries, rather obscurely seen than demonstrated by experience, needed fructification by an agent of execution docile and enterprising, and venturesome in proportion to the little he knew of the question.

"To Jackson belongs the credit of the idea; to Morton the realization of the idea: without the former etherization would not have existed; without the latter its advent would have been retarded many years. Both, by different claims, merit much from the human race for endowing surgery with a heroic means of abolishing physical pain. But if posterity erects statues to Jackson, she will hesitate perhaps to recognize as one of her benefactors a vulgar merchant of letheon." (p. 61.)

"A vulgar merchant of letheon!" the whole course of this individual since M. Perrin's work was published, but confirms the justice of the sentence. What was true then, is true now, and "pity 'tis 'tis true."

"Morton, from the first day, had seen in the assured power of abolishing pain only a good business to follow; thus, his first care was to monopolize, for his own profit, the benefits of etherization." (p. 57.)

For the honour of our country we deeply regret the facts in regard to this discovery, but can still congratulate ourselves that our profession is not implicated in the mercenary traffic which was attempted.

In tracing the early part of the discovery of anæsthesia M. Perrin seems to have followed Figuier (*Découvertes Scientifiques; l'Etherization*, t. iii.), for he quotes him frequently. In the later part he extracts freely from Jackson's "Defence," which is, of course, the testimony of an interested party. Certainly we know of very well informed medical men of this country who doubt whether M. Perrin could substantiate what he says as to Jackson's share in this discovery, especially in regard to his having placed beyond doubt that anæsthesia by ether was free from danger.

But there is another man belonging to this country, too, whose share in the discovery of anæsthesia has never been recognized as fully as it undoubtedly deserves to be. We allude to Horace Wells, of Hartford. He, either independently, or acting upon the long-forgotten suggestion of Sir Humphrey Davy, that nitrous oxide might be used to abolish the pain of surgical operations, pursued the study of anæsthesia by this gas with ardor and perseverance, and there is little room for doubt that he first established

the fact of anæsthesia, and glad we are to see that M. Perrin gives him full credit for it.

"The honour of the first public and authentic trial of surgical anæsthesia, by the aid of means newly discovered, belongs entirely to an obscure dentist of Hartford, a small town of the county of Connecticut."[1] (p. 47.)

This successful trial occurred several years before Jackson proposed, or Morton used ether; both these men had opportunity of communicating with Wells, and they knew the direction of his labours, and had witnessed some of the results, and there is no doubt that much for which they have obtained credit was derived from him—that the modern source and origin of anæsthesia was the brain of Horace Wells.

Yet his memory is neglected, and his name almost forgotten. Poor Wells! in all the annals of science we know no history more sad than his. Seeing clearly the good to be attained, yet failing to realize it, disappointed, chagrined, driven from the amphitheatre by the derision of a pack of thoughtless students, his heart broke under the trials, and with his own hand he terminated a life which had been spent in endeavouring to confer upon the race the greatest boon to suffering humanity. He died with the discovery almost within his grasp. He was a Columbus, whose bark went down within sight of the new land.

But, into this question as to the real discoverer of anæsthesia we cannot go. An impartial history of the subject has not yet been written, and probably will not be until all the actors have passed from the stage; then the relative claims of Wells, Jackson, and Morton may be impartially examined, and the merit of each impartially determined.

Authors are not agreed as to the mode of action of ether and chloroform. Leaving out of view the more mechanical theories—such, for instance, as that of Faure, which based anæsthesia upon a local change in the respiratory tissues—and which have been conclusively shown to be untenable, there remain two leading doctrines as to the *modus operandi* of these agents. One of them is that anæsthesia is produced by an interference with the interchange of oxygen and carbonic acid in the blood, and is therefore asphyxia; the other, that the agents circulate in the blood, and have an especial elective affinity for, and exert a direct action upon, the nerve tissue; that, acting as a direct poison, they abolish consciousness and the sensomotor power. The latter doctrine is maintained by Perrin, and the experimental evidence which seems to substantiate it is more fully given in the physiological work on the *rôle* these agents play in the economy, which we have already mentioned. Of the former theory Dr. Sansom is the especial advocate. It will be seen that it is entirely *physico-chemical;* to those who maintain it *vital* actions are nothing.

"Anæsthetics are agents which, when absorbed into the circulation, exert an influence upon the blood. They are shown to have the power of altering its *physical character* and its *physical properties.* * * * Narcosis ensues; and is due, not to the influence of a circulating poison, but to the influence of an altered blood." (*Sansom*, p. 55.)

"Whatever produces, to a certain extent, insufficient aeration of the blood, produces narcosis; and whatever produces narcosis, produces, by some means or other, imperfect aeration of the blood." (p. 62.)

Of this doctrine we have to say, first of all, that as it is physico-chemical

[1] We translate as nearly literally as possible.

in nature, so it is based too exclusively upon physico-chemical experiments. We refuse to accept, as having more than a remote bearing upon the decision of the question, such evidence as that presented on page 43; because Gosselin "exposed the brain of a dog and poured chloroform thereupon," and because he "divided the organ and applied chloroform," and "no diminution of sensibility followed," we do not believe it therefore follows that anæsthesia is not produced by direct action of the remedy as it circulates through the nervous centres after inhalation. Neither do we accept as proof the fact that when chloroform is added to animal or human blood, it changes the shape of the corpuscles, and destroys them. Referring to Dr. Harley's experiments,[1] upon which the author lays great stress, we find them of the same nature; chloroform added to blood out of the body, interferes with the taking up of oxygen, and promotes the absorption of carbonic acid. To add a powerful chemical body to drawn blood, and attempt to deduce conclusions, from its coagulating or chemical action, as to its physiological action when introduced into the vital current by inhalation, is, it seems to us, to violate all sound rules of experiment and deduction; it is confounding the physico-chemical action of the agent with the subtle changes it occasions in the production or manifestation of nerve-force.

Again, we suggest that to term the anæsthetic process asphyxia is to necessitate a special kind of asphyxia to meet the case, for it certainly does not resemble the ordinary kind. In asphyxia, sensation is only lost under the influence of the circulation of black blood; in anæsthesia the blood does not become black, or nothing like of the deep hue of asphyxia, when sensation is abolished, unless the inhalation of the anæsthetic be *prolonged*, or in the cases of experiment on animals which are made to breathe the vapours from closed receptacles, thereby complicating the influence of the remedy with that of expired air; in asphyxia the loss of sensation is a secondary phenomenon, in anæsthesia it is primary; "numerous researches made by Renault, Longet, Blandin, and Guerin do not permit us to doubt that in anæsthesia complete loss of sensibility occurs before the arterial blood changes its colour."[2] The motive power, too, is differently affected in the two processes; anæsthetics abolish it, while on the contrary it persists in asphyxia to the end; "by mechanical irritation convulsions can be caused up to the moment of death."

Probably the weakness of M. Perrin's argument is in the fact that he bases it too exclusively upon the *quantity* of chloroform formed in the different tissues after death. He and his colleagues determined this to be as follows: "The blood being taken as the standard representing 1, the brain contained 3.92 parts; the liver, 2.08; the muscles, 0.16;" this view, therefore, is that "anæsthetics accumulate in the nervous centres by virtue of an elective affinity." Upon this point Dr. Sansom attacks them, and especially in regard to the large amount shown to be also in the liver. But it appears to us that the quantity thus found after death, is not necessary to the argument, and that the doctrine might be maintained had the amount never been determined. Nothing is better established in therapeutics than that certain medicines act invariably upon certain organs however introduced; that some pass out by one channel and some by another; we may call it "elective affinity," or what we will, the facts remain the same, and we should prefer to base the theory of the action of these remedies

[1] British and Foreign Medico-Chirurgical Review, Oct. 1856, p. 429.
[2] Perrin, p. 191.

rather upon reason, the results of analogy, of clinical observation, and physiological experiment, than upon physics, chemistry, or post-mortem examinations. Viewing the question by these lights, we feel compelled to adhere to the vital theory until we see something more conclusive than has yet met our eye.

"What experimental physiology permits us to establish is confirmed by clinical experience. During operations performed upon man in a state of complete anæsthesia, nothing calls to mind the idea of asphyxia; in the latter the mental faculties are simultaneously affected, the skin is marbled, the tissues turgid, the arterial blood of deep black hue; in the former, the mental faculties are only progressively invaded, the face is pale, cadaverous, and the blood escapes from the arteries in vermilion jets." (*Perrin*, p. 192.)

"The anæsthetic agents, principally chloroform and ether, act directly upon the nervous centres, and have for effect to veil, or temporarily destroy general sensibility and motor power. This action, which might have been *a priori* suspected, has been confined experimentally by the researches of physiologists, and in particular by those of Flourens." * * * "The anæsthesia produced by chloroform and ether determines, in the nervous centre, modifications differing in every point from those produced by carbonic acid or the oxide of carbon." (*Dictionnaire.*)

We shall not enter upon the question whether anæsthetics exert a favourable influence or not upon the result of operations. We supposed it was no longer an open one. The investigations made and statistics gathered in consequence of the rough challenge given to them by Dr. Arnott in 1856, seemed to have satisfactorily settled the point that no unfavourable effects resulted from their use either upon the healing of wounds, the occurrence of accidents or diseases, or upon the mortality after operations. Recently, however, a surgical writer in our own country has re-opened this question. Dr. Hamilton, in his *Treatise on Military Surgery*, not only expresses his doubts upon this point, but is decidedly of opinion that they "produce certain effects upon the system which tend to prevent union by the first intention, and consequently they must be regarded as, indirectly, causes of suppuration, pyæmia, secondary hemorrhage, erysipelas, and hospital gangrene." The charge is a most serious one, and emanating from an authority so high demands the most careful attention. As it can only be sustained or refuted by a further observation of facts and by carefully collected statistics, we refer the decision to the stern tribunal of clinical experience; merely remarking that, as it now stands, all authorities upon anæsthetics, as well as the leading surgical writers of the world, are against our countryman in this matter.

But the great point connected with anæsthetics is, as we have before intimated, the fact that alarming symptoms and even death sometimes occur during their administration. Were there "no danger in what show of death they make," not only would our present task be easy, but the world would possess at least one good unmixed with evil. As it is, the amount of danger, the sources of its origin, and the power of our art to prevent it, as well as the relative agency of the patient, the remedy, and the mode of administration in producing it, are among the most interesting and important questions connected with the subject. We believe that incorrect views in regard to them exert an injurious influence upon the use of these agents, and tend to limit and restrain their administration to the injury of suffering humanity, if not of the profession. Certainly these points deserve our serious consideration however rarely danger may appear and death occur, compared with the vast number of inhalations, and to this portion of the subject we shall devote considerable attention.

First, as to the number of deaths which have occurred from chloroform. Sabarth and Perrin both give "about two hundred," but as the former includes several cases of suicide, and both give deaths which followed several hours consecutively to the administration, and many which are so indefinite as to be unreliable, both lists should be subjected to close examination for scientific purposes. Indeed, Perrin does this and fixes the number of fatal cases due alone to chloroform at seventy-seven. We shall follow Dr. Sansom, the latest authority; he has collected fifty-six cases, which, with fifty given by Snow, makes one hundred and six, and agrees very closely with the report of the Committee on Chloroform to the Royal Medical and Surgical Society, which gives one hundred and nine.

But accuracy in this respect is not necessary; the only condition in which it would be essential would be that of having the total number of administrations of the remedy. Then we could learn what would be very interesting, if not instructive, to know: the relative number of deaths to administrations. This it is impossible to learn, and many efforts have been made to get an approximation by estimate, generally ending in the proportion of 1 to 20,000 to 30,000. Lately, Dr. Richardson has been writing the medical history of England, and has transcribed from the books of the various hospitals visited the number of inhalations of chloroform, and he found but one death to over 17,000 inhalations. Yet all these calculations differ much and assist us but little; in the language of M. Perrin, "they are as easy to produce as difficult to contest," the fruit of "a sterile erudition which dazzles but never enlightens." All we can say is, that some persons have enjoyed complete immunity from accident who have dealt with the agents daily for years, as is the case with Velpeau and Syme; and the instance of the French Army in the Crimea with 30,000 administrations and no death is remarkable.

The period of administration at which death occurred is of the deepest interest, both theoretically and practically. Thus of the 109 deaths a large proportion took place early in the process, before the commencement of the operation for which it was given; "a strange and certainly a noteworthy fact." The table shows within a fraction of fifty per cent.:—

Before full effect of chloroform . . .	50
During " " . . .	52
Not stated	7
	109 (*Sansom*, p. 68.)

In regard to sex, all authorities agree that men are more subject to death than women, notwithstanding the number of administrations in obstetrics. Snow gives the proportion as 3 to 2; Scoutetten, 2 to 1; Kidd, 4 to 1; and Sansom, and the report of the chloroform committee, which we should consider the most reliable, respectively 2.8 to 1, and 72 males to 37 females.

Age has been shown to have a powerful influence upon the mortality under chloroform. Thus, while it has been given at all ages, from a few days, or even hours, up to the extreme limit of old age, the largest proportion of deaths have occurred in middle age, at the period of most robust health and greatest vigor, and children have shown so great an immunity from accident as to cause the anæsthetic process in them to be considered entirely free from danger. Time, alas! has proved this to be a fallacy; even since the publication of the latest work upon this subject this new and important, but sad truth, that children are also liable to accident from chloroform has been learned. While Sansom gives in his table no case of

death under five years, a case at two years, which occurred at Liverpool, has been reported,[1] and another at four years is alluded to in a discussion at the Société Impériale de Chirurgie,[2] although we have seen no report of the case.

The condition of the patient exercises an influence widely different from what would be expected, although authorities do not seem to agree upon the matter :—

"It certainly appears that the healthy and strong stand a worse chance with chloroform than those who have been debilitated by disease. * * This is so supported both by figures and by individual observation, that we can scarcely refuse to receive it, as it has been entitled—the '*law of tolerance.*'" (*Sansom*, p. 67.)

This we believe is the general and correct doctrine, yet M. Giraldes differs from it, and agrees more nearly with Hamilton :—

"There is meanwhile one pathological condition which demands extreme prudence in the employment of anæsthetics. I allude to those individuals exhausted by profuse hemorrhage, or in a state of pronounced chloro-anæmia, and in whom the nervous system has become very excitable and more susceptible to be impressed by the action of external agents which, like chloroform, affect directly the nervous centres. These conditions, in fact, appear to me to be in some cases a serious objection to the use of these agents, and when we are obliged to make use of them, extreme prudence should be exercised, and the diverse functional modifications which they may produce should be watched with the greatest attention." (*Dictionnaire*, p. 243.)

The kind of operation for which the chloroform has been administered, is, again, the reverse of what would have been anticipated. By far the largest proportion of deaths has occurred in cases of the most trivial operations; a fact which has created universal surprise, and excited deep interest, from the apparent impossibility of furnishing any adequate explanation. We abridge from Sansom (p. 69), the following table :—

Operations of minor import—such as extraction of teeth, etc.	62
Operations of moderate severity—removal of breast, dead bone, etc.	26
Capital operations	7
Reduction of dislocations	6
Delirium tremens and mania	4
Natural labour	2
	117

It is to be very much regretted that Dr. Sansom has not given us the particulars or the authorities of the last class—the two cases of death during natural labour. Nothing, certainly, would have been of greater interest, for it has been maintained and repeatedly stated that no death ever occurred from the administration of chloroform during natural labour. If these are cases such as have been brought forward by those opposed to the use of chloroform in obstetrics when the patient administered it to herself, no one but the nurse being present, we should like to know it. Equally should we like to learn if there have really been two cases of death under these circumstances, and the particulars concerning them. As it is, we have looked in vain for them; Dr. Sansom's book contains only the line we have quoted; the other works not a word. We thought we should find them in the list of deaths of the report of the chloroform committee,

[1] Medical News and Library, January, 1866.
[2] Gazette des Hôpitaux, Juin 23, 1866.

but they are not there, and Dr. Sansom quotes from this report, without remark, in a subsequent chapter, that "there is no well-authenticated instance of sudden death recorded, either in this country or abroad, as occurring from the administration of anæsthetics during natural labour, when such administrations have been conducted by a qualified medical man."

These are some of the most notable facts connected with chloroform accidents which we have thought necessary to briefly mention before proceeding to a statement and examination of the doctrines of our authors in regard to the manner of dying and the probable determining cause of death. That equally able men are not agreed upon this point need excite no surprise, and will not with any one possessing but slight acquaintance with the difficulties which embarrass a decision. In regard to the symptoms when death takes place, the reports of fatal cases are written after the fact, and are the remembrance of events which occurred with great rapidity and under an agitation of feeling on the part of the observers easier imagined than described, and written too with a very natural regard for those most deeply concerned. Experiment upon animals, so valuable a means of determining such questions, fails here because it seems alone to teach us that we cannot produce death in them with the suddenness and rapidity of chloroform death in man. When it is said, finally, that examination of the body after death throws no certain light upon the mode of dying,[1] the great difficulty of the subject will be seen at once. It is, in fact, one of the most abstruse problems ever presented to the human mind for solution.

The first statement to be made in regard to these deaths, is that undoubtedly a considerable number, and especially of those which occurred at the very commencement of the inhalation, were entirely independent of the chloroform. They were purely the result of emotion; a snapping of the vital cords strained to their utmost tension by the arrival of the long-dreaded moment for the operation. Such sudden deaths during, or even just before an operation, have always been known, and many such have been reported. The case of Desault's is well known; he traced with his finger-nail the line of incision in the perineum of a patient bound up for lithotomy, and the man shrieked and died. The case of Simpson's is more note-worthy because chloroform was to have been administered for the first time; the doctor was delayed, and the operation proceeded without it, the patient dying suddenly after the first incision. Had it been given it would doubtless have been not only the first but the last administration! All our authors agree that many of the sudden and early deaths were really caused by psychical influence and not by the anæsthetic. Thus, Dr. Sansom says:—

"It is reasonable to suppose that fright or apprehension may have had some share in causing the mortality among those who have succumbed before the symptoms of anæsthesia have been induced—that chloroform may have been but one (and that perhaps the least) among the influences." (p. 66.)

We believe this statement far too moderate, and think that few are aware how frequently such deaths occur. The number collected or mentioned in

[1] "In the present condition of the subject it must, alas, be said, that the diagnosis, the matter of fact of death by chloroform, is to be established more by the circumstances preceding the decease, than by the results of the *post-mortem* examination." (*Saburth*, quoted from *Casper*.)

these works has certainly surprised us. M. Perrin, in his introduction, gives the following:—

"A robust man died suddenly of pain during the efforts made to reduce a suspected luxation of the knee.

"A soldier, aged 25, affected with phymosis which concealed fungous growths, submitted very reluctantly to an operation. No sooner did he see the surgeon's hand armed with a bistoury than he fell into a syncope and instantly died.

"A woman, 45 years old, of bilious temperament and very irritable, had a cancer of the breast. She only consented to an operation with the greatest difficulty. During the operation she died in the presence of the assistants, even under the hands of the surgeon, just as he had made the two incisions and began to dissect out the tumour.

"An old man, who was suspected of having stone in the bladder, was to be sounded; he had an unconquerable fear of this investigation. Scarcely had M. Civiale approached the meatus with the sound, than, seized with terror, he died in the presence, and in spite of the earnest cares of such celebrated practitioners as Civiale and Honoré.

"Similar accidents have happened twice at the Hôtel Dieu, in the practice of Roux.

"This list could be increased, if necessary, by the well-known cases of Garangeot, Chopart, Desault, Cazenave, and several other authors."

Dr. Sansom alludes to some of these and to another which occurred to Mr. Stanley.

Dr. Sabarth delivered a woman with the forceps—"an easy forceps delivery," and left her doing well: within fifteen minutes he was called back to her in great haste, and found she had suddenly died. He truly says that had chloroform been administered, however slightly, it would have received the blame of the death. He also gives the following case, which happened to Cazenave, of Bordeaux, and is alluded to in Perrin's list.

"A man, 40 years of age, was thrown from his horse and received a broken leg. Amputation appeared necessary. The patient was so depressed by the idea of losing his limb, that although the intention had been to chloroform him, this was abandoned, and it was agreed only to make a show of giving it. A cloth, without any chloroform, was held some distance before his face. Scarcely had he made four inspirations, than suddenly respiration stopped, and the heart ceased to beat. All efforts were vain; he was dead."

Lister gives a similar case which occurred in the practice of Dr. Mackenzie, of Edinburgh.

"Being called to see a gentleman who had fractured his radius, he had some thought of employing chloroform in examining the arm, but, changing his mind, made the necessary manipulations without it. He then proceeded to leave the house, but had not got down the steps leading from the door when he was called back with the announcement that his patient had suddenly expired."

Giraldes, after examining the danger of chloroform administration, comes to this conclusion, which is important enough to be placed in italics:—

"*The accidents which have been observed do not much surpass in number the cases of sudden death which have occurred without apparent cause during or soon after operations.*" (*Dictionnaire*, p. 245.)

Whether this statement be true or not, it may well be urged in favour of chloroform that by its use in a part of these cases, death would in all human probability have been prevented, by banishing emotion and destroying pain, and that if we are obliged to grant that it sometimes kills, it sometimes also directly saves.

Farther, from the list of deaths charged to the account of chloroform we would deduct all those where a very severe operation was performed, or one accompanied by much hemorrhage. To attribute the death which follows such an operation as removal of the scapula, or, as we have heard, of ovariotomy of forty minutes' duration, to the chloroform employed, is manifestly unjust. In such cases, chloroform should bear a portion, but only a portion, of the responsibility. It comes, as Giraldes well says, "to add a new factor to the causes of death," but to count, or to weigh such cases in an estimate of the danger of anæsthetics is unfair.

Were we writing solely for the *future* of chloroform, there is another class which we should also eliminate from this list, because experience has taught us the danger of its administration under such circumstances, and it can therefore be avoided. We allude to patients suffering from delirium tremens. No less than nine deaths have taken place in such subjects. Indeed, that the habitual excessive use of alcoholic drinks excites the worst possible influence upon the patient in regard to chloroform inhalation, is the universal testimony of authorities. Experience upon this point has accumulated since Nelaton first called attention to the fact, and it may now be said to be the universal conclusion that anæsthetics should be administered to "hard drinkers" only under circumstances of absolute necessity.

Proceeding with our investigation as to the cause of death and the manner of dying, two subjects intimately connected, and commencing with the best established doctrines, we find that death under chloroform does not take place from deep narcotism, or too prolonged administration; upon this point all our authorities agree, although some say "not from an *overdose*," a very different expression, and one to which we do not assent.

"The history of surgical anæsthesia, of its accidents and its errors, equally teaches us that the misadventures due to chloroform are not the result of a methodical administration too long continued." (*Perrin*, p. 172.)

That chloroform can kill in this way no one doubts; but if a man commits suicide, or kills himself, as Toynbee has just done, by breathing its vapour *à l'outrance*, or a woman during labour inhales it with no competent person to watch its effects, and dies, these facts should not be held against the safety of the remedy when properly used. That chloroform does *not* generally kill in this way, we have absolute proof; first, the early stage of the process at which death took place in so many of the fatal cases, and, second, the known small quantity which was administered in some of them. Still, Dr. Sansom is of opinion that death was, in a few of the cases, caused by too deep narcotism, and thinks this must be looked upon as one of the causes of death.

The deaths under chloroform cannot be ascribed to disease of the heart. As soon as it became known that the heart was depressed in its action by the anæsthetic vapour it was naturally concluded that a diseased organ would feel the depressing influence more powerfully than a healthy one, and an explanation being a greatly needed want, this theory found a ready acceptance. But Snow taught that the assumption was false, and we have scarcely anything to add from these authors to what he wrote upon this point, except that the presentation of their testimony may add to the authority. All concur that disease of this organ is no contra-indication to the administration of chloroform, except M. Perrin, who believes it predisposes to syncope.

"Over and over again I have given chloroform to patients affected with incompetency of the valves of the heart, and I have found them very good

subjects indeed for its influence. * * * In persons affected with valvular disease—in those in whom cardiac mischief is the result of acute rheumatism, for example—there is no special danger in the administration of chloroform." (*Sansom*, p. 76.)

We might repeat nearly the same in regard to fatty degeneration. M. Giraldes, the writer in the *Dictionnaire*, makes the statement that Snow considered this a substantial contra-indication. But this is not so; he says: "I have given chloroform in numerous cases without ill effects where the symptoms of this, as well as other affections of the heart, were present in a very marked degree."[1] M. Giraldes says that experience has demonstrated that the deaths have been wrongly imputed to this pathological condition. And—

"Individuals, considered to be labouring under this organic modification, have been submitted to chloroform inhalation with impunity, and some of those who have succumbed during anæsthesia have not presented the lesion in question."

That special care should be exercised in such cases seems reasonable and is generally inculcated. Dr. Sansom would abstain from it in fatty degeneration:—

"The general lesson inculcated would seem to be this: that in cases of marked fatty degeneration of the heart, chloroform should not be administered; that in cases wherein a debility of the heart is suspected, unusual care should be exercised to administer a free dilution, so that the heart should not be paralyzed by the sudden shock of an influence which it cannot withstand." (p. 77.)

There are some, however, who go much further than this, and boldly claim that by abolishing pain and preventing its influence in producing irregularity of the heart's action chloroform directly favours the safety of the patient. This was Snow's doctrine, and the report he gives of the action of the heart in a patient whom he observed under lithotrity, both with and without the anæsthetic, is one of the strongest proofs of this position, as it is one of the most interesting observations relating to this part of the subject on record.

Mr. Lister is of this opinion:—

"It might, perhaps, have been expected *a priori* that chloroform, in the early or exciting stage of its operation, would act upon a diseased heart like mental emotion, and cause irregularity or cessation of its contractions; but this does not seem to be the case. Judging from my own experience, I should say that it tends rather to remove [prevent?] intermission or irregularity of the pulse; and on the whole, I believe that chloroform, by preventing shock and mental effort during the operation and anxiety before it, is in reality a great source of safety in heart disease."

Notwithstanding this gentleman witnessed a death under chloroform and the patient's heart was found to be "extensively affected with fatty degeneration," he nevertheless attributes the death to another cause, which will be considered presently—the shock of the incision; a cause which cannot exist with complete anæsthesia; and as to whether chloroform promoted the fatal result says:—

"My own impression is, that if it had been pushed to the usual degree, the fatal occurrence would have been averted."

The doctrine that death results from a particularly idiosyncrasy of the patient has had several advocates of ability and high professional standing,

[1] On Chloroform and other Anæsthetics, London, 1858, p. 54.

and at one time it was quite popular. It was, however, long since found unreliable, and is, we believe, at present, entirely abandoned. As M. Perrin justly says, if the deaths resulted from such a cause their number should be more regularly proportionate to the number of administrations, which is far from being the case. He cites too, as going to show the fallacy of this view, that "in spite of a number of administrations relatively limited, the cases of sudden death in the hands of dentists figure in the proportion of at least 10 to the 100 in the necrological table." But there is stronger proof still, in the fact that in many of the cases of death the patients had previously inhaled chloroform; of the 50 fatal cases of Snow 13 had done so; in one case it had been given six times before. This destroys all foundation for the doctrine. Idiosyncrasy is a particular mode of being or of reacting to the stimulus of external agents peculiar to the individual, and so much a part of him, or of his life, that it is ever with him, does not change from day to day, and ceases only when he ceases to live.

This conclusion has been almost universally and very certainly arrived at by authorities on the subject: death under chloroform in the human subject does not always take place in the same manner, or as a consequence of the same pathological causes. And it is a decided advance to arrive at such a conclusion, for there has been a tendency to cling to some particular theory of death as the only and invariable one. Such theories have been founded on but partial views of the phenomena, have led to the use of but partial precautions for the prevention of accidents, and have decidedly interfered with further advances of our knowledge. The accepted doctrine now is that death takes place by syncope or paralysis of the heart, and by asphyxia, authorities being divided as to which is the more frequent and which deserves the greater consideration. The able advocacy of Snow gave great predominance to the doctrine of death by paralysis of the heart, and backed as it is by the unimpeachable evidence of experiment as to the depressing influence of chloroform upon the heart's action, it bids fair to maintain its supremacy. We shall see, however, that views differ as to whether this cardiac paralysis is primary or secondary. With Snow it was primary; blood charged with more than five per cent. of chloroform vapour acted directly on the organ, and his experiment of stopping the heart's action in anæsthetized animals, by blowing chloroform vapour on the exposed organ, is strongly confirmatory of this view. Yet there is strong proof and much reason for the belief that this, at least, is not the only way in which the heart is paralyzed, that the paralysis is often of reflex character, secondary to some peripheric excitation or the result of some profound effect upon the centres of the nervous system.

Let it not be imagined that this question as to the mode of death is one of theoretical interest merely; it has practical bearings of very great weight.

"During the period in which the doctrine of asphyxia was dominant, and during which we were preoccupied with improvement of the manner of anæsthetizing, the annual mean of sudden deaths was about seven for the space of seven years.

"Since the ideas of syncope have prevailed, and that we have learned to place great value upon the moral state, whether in regard to the appreciation of the indications or to the manner of conducting the anæsthesia, the annual mean has remained fixed at three. And meanwhile the manner of inhalation has not been changed; we employ chloroform oftener and with less hesitation. What is this but to say that we know better how to use it, or, more exactly, that we know better to whom to give it?" (*Perrin*, p. xiii.)

We will give Dr. Sansom's views as to the mode of death first; it will

be seen that he introduces a third class, one not mentioned by any other author.

"Death in the human subject may take place by three modes. I. By syncope. II. By asphyxia. III. By necremia.

"The death by syncope may be in one of two forms: (*a*) in consequence of the loss of the irritability of the muscle. * * * This is the common form of death, and is akin to the death from shock. * * * (*b*) tonic spasm. This is not usual, but has occurred; the heart having been found firmly contracted and containing no blood. Here would seem to be a sudden influence on the sympathetic—an irritation, not a palsy.[1]

"The death by asphyxia may be peripheral or central: (*a*) from disorder of the lungs themselves, as in cases of disease wherein a rapid congestion may be superinduced; or (*b*), from suspension of the motor power. * * *

"Death by necremia occupies a position between these more decided forms. Death is due to a faulty condition of the circulating blood, which at one and the same time enfeebles the heart, impairs the activity of the nervous system, and prevents the due performance of the vital changes in the systemic capillaries." (pp. 98, 99.)

As to the relative frequency of these different forms, the author does not express himself definitely; he says sudden cessation of the heart's action is the most frequent of all indications of death. He copies the table of the chloroform committee, which gives 62 deaths by syncope out of the 109; 9 in which pulse and respiration ceased together; and only 2 in which respiration failed before the pulse.

Dr. Anstie's conclusions are arrived at after careful study of the subject and from the observation of one fatal case, and of twenty-one cases in which alarming symptoms occurred in his own practice. He believes death takes place in two ways depending on the rapidity of absorption of the vapour.

"When the impregnation of the blood takes place with *moderate* rapidity, the sympathetic nervous system is the *ultimum moriens*, and death *begins at the lungs*.

"When, on the contrary, the circulation becomes very rapidly charged with a large proportion of chloroform, the narcotic effect may fall with such force upon the sympathetic nerves as to extinguish their vitality at once."

* * * "From the fact that in the immense majority of reported fatal cases the first symptom of danger was confessedly the failure of the pulse and the blanching of the countenance, the conclusion appears strongly indicated, that paralysis of the heart is *the* source of danger in surgical chloroform narcosis." (pp. 382, 383.)

Dr. A. is a believer in the direct action of chloroform as it circulates in the blood as such, both in producing anæsthesia by its action on the nervous centres, and death by its influence upon the sympathetic nerves of the heart.

[1] The following quotations will show how far one of the highest authorities upon affections of the heart is willing to commit himself upon these points. The italics are our own.

"Now, it is infinitely probable, changes occurring in the ganglia themselves, either dynamic or structural, may be the immediate cause of suspended pulsation of the heart in some cases—but the clinical proof is yet wanting. Still, in certain cases of chloroform inhalation, where death occurs through the heart, *it seems reasonable to believe* the vapour, acting directly on the cardiac ganglia, plays a part in instantaneously arresting their activity." (*Walshe on Diseases of the Heart*, Am. ed., p. 134.)

"Does the heart ever become the subject of true spasm, either clonic or tonic? *A positive answer, founded on clinical evidence, cannot, in all probability, be given to this question.*" (p. 135.)

Dr. Ellis recognizes three sources of danger from chloroform:—

"1st. From its influence over the heart; 2d. From its effects on the functions of the lungs; and, 3d. From its action as a narcotic poison in the production of coma. The two latter sources of danger may arise either from the vapour of ether, or possibly from that of alcohol, as well as from that of chloroform." (p. 29.)

In M. Perrin we find a strong advocate of death by syncope. He has given a full statement of all the reported cases, and entered at very considerable length into a critical examination of the facts detailed, and of the theories which have been advanced to account for them. His conclusion is that "death is the result of dynamic perturbations, of which syncope is the habitual organic expression." (p. 273.)

"The mechanism of death, judged by the order of abolition of functions, is always the same, and manifests itself as follows: Sudden arrest of the sounds of the heart; immediately afterwards, exhaustion of the forces, definite cessation of respiration, extinction of all vital manifestations." (p. 352.)

But this syncope, according to him, is not the effect of the anæsthetic, although all anæsthetics predispose to syncope, but an accidental complication, independent of the agent, and having some other cause, "which by its nature is independent of, and should be separated from, the phenomena of anæsthesia."

"Abstracting the exceptional cases in which it may be supposed that death was the result of an imprudent or excessive administration, the facts demonstrate that sudden death during the anæsthetic process is always the result of an accidental syncope." (p. 405.)

"Viewed as a direct effect of the anæsthetic agent, sudden death during anæsthesia cannot be explained by what we know of the action of these agents; it presents none of the principal characteristics of this action; it rests an eternal enigma, surrendered to the convenient interpretations of occult influences far from satisfactory, and, above all, useless. Viewed as an accident, on the contrary, it becomes a regular effect, normal, the nature of which is revealed by the observation of similar accidents which happen without anæsthetics, and, what is more important, the immediate causes of which are deduced without effort, either from the conditions created by the state of anæsthesia, or from anterior conditions of the patient, or also from the manner in which anæsthesia has been practised." (p. 357.)

But with M. Perrin syncope means far more than it does with us. We have seen that Dr. Sansom makes it synonymous with paralysis of the heart; M. Perrin makes it synonymous with "sideration:"

"In order to avoid all confusion, we will say that sudden death by sideration and sudden death by syncope, or, if you will, by *syncope foudroyante*, represent but one and the same form of accidents." (p. 406.)

"Sideration" is a term which has become pretty familiar, from its use by French writers in connection with this subject. It is a death, sudden, instantaneous, without material cause; the result of some profound dynamic perturbation of the nervous system; and not, as our author states it in this connection, of the nervous centres merely, but of "the entire nervous system, as well the nerves of the periphery as their central point of emergence."

It will be seen, then, that M. Perrin adheres to the *name* rather than the *thing;* his "syncope" includes many forms of death, having widely different pathological orgin. For instance, he considers one class of deaths as by "syncope of psychical origin;" a class which includes all those which we term death from *emotional causes*, a class which more truly than

any other is in accordance with his views as to being of accidental origin and entirely independent of the anæsthetic as a cause. We have already shown how frequently death of this kind takes place. Another class he terms "syncope of organic origin," and subdivides it into those arising from the brain and from the lungs, and explains the fatal result by the influence which both exert over the central organ of the circulation. To the latter, if not to both of these, we shall presently give further attention.

There are two curious positions into which M. Perrin is betrayed by his reasoning, and, by the views he has adopted, deserving a moment's consideration. The first is the acceptance of a peculiar idiosyncrasy in regard to syncope, after having rejected such a thing in reference to chloroform, and the second, that a person peculiarly liable to syncope is not therefore a bad subject for chloroform! Both are exhibited in the following extract:—

"We have combated the idea of an idiosyncrasy special to chloroform, but are obliged to recognize the existence of a certain predisposition in regard to syncope. There are subjects who have faintings upon almost every occasion, and almost at will. This predisposition may be habitual, permanent; such, from experience, should inspire little fear. We have already said that women, in whom such a disposition appears especially developed, are not more exposed than men to the chloroformic syncope. It may be accidental, and develop itself under the influence of multiform causes, capable of modifying, at any given moment, the vital force of resistance, of creating such a nervous condition that the least emotion, the least shock, provokes a syncope. In this is the real danger." (p. 429.)

The practical effect of M. Perrin's doctrines are far too important to be passed over in silence. From the extracts we have given, and from the work at large they are, briefly stated, that sudden death is a danger inherent to anæsthesia, and by virtue of conditions belonging rather to the *subject* than to the agent or to its mode of administration, that this danger cannot be foreseen, and therefore cannot be guarded against:—

"The cause of danger, being accidental and inherent to the subject, remains permanent as the subject; there does not exist, and there never will exist, any means by which it can surely be avoided." (p. xiii.)

We do not believe it. Meanwhile we postpone further examination of this point to consider for a moment the practical effect of such doctrines upon the every-day practice of our profession. Is it not to restrain the use of this important class of remedies within very narrow bounds? Is it not, in fact, to limit their use to operations of great severity, and to cases of absolute necessity? Faithful to himself, this is what M. Perrin would do. He acknowledges the difficulty of laying down absolute rules; admits that one person suffers more from a slight, than another from a severe operation; but he banishes it entirely from minor surgery (which local anæsthesia will now most surely do), and also from all such operations as those for ingrown nails, extraction of teeth, etc. He banishes it also from all those operations known as "operations of complaisance," those for the relief of deformities, and from use in all those "researches designed to triumph over a supposed simulation or dissimulation, or to clear up a medico-legal question."

And this is the course all those must follow who believe that there is an inherent danger in chloroform which no sign foreshadows and no care can avoid. As the surgeon should never undertake an operation without candidly laying before his patient the risks he must run, so should the chloroformist say honestly, whenever he administers the anæsthetic, if this

doctrine be true, that possibly death will occur during the use of it, and the temporary abolition of consciousness prove an eternal oblivion. We will not dilate upon the influence such a communication would exert on the mind of the patient in favouring a fatal event during the inhalation, or upon the result of the operation for which it was inhaled; nor upon the denial thus made to suffering thousands of a boon which more than any other in the records of science deserves the name of heaven-given.

M. Giraldés, in the *Dictionnaire*, finds Snow's theory of death unsatisfactory, and asks what we shall substitute for it. This is his answer:—

"We must admit that all the hypotheses advanced for the solution of this difficult problem are open, in divers degrees, to some objections. That which appears to approach nearest to reality, and which at least is founded on rational physiological grounds, is without doubt the theory which regards the mortal accidents during anæsthesia as produced by an apnœa, occasioned by an accumulation of the anæsthetic fluid in the medulla oblongata."

But this theory is open to the objection that it does not account at all for the *early* deaths and especially for those where very little of the agent was inhaled. It is based, of course, on the statement of Lallemand, Perrin, and Duroy, in regard to the amount of chloroform in the various tissues. We are ready to agree to the general statement of this author that it is "by an intervention in the functions of the nervous system that the sudden arrests of respiration, syncope, and sudden deaths are produced," but cannot yield assent to his explanation that these effects are produced by an unusual quantity in the nervous centres. Sometimes this is undoubtedly true, but cannot be in regard to those which occurred at an early period of the inhalation.

We shall not attempt to follow Dr. Sabarth through an examination of the different theories he has collected from various writers, but content ourselves with a table showing the number of deaths by each form, compiled from a careful examination of all the cases he could find, reported with sufficient detail and accuracy for such a purpose; they were only 47 in number, and his conclusion as to the mode of death is from the symptoms which presented themselves and the results of the post-mortem examinations:—

Asphyxia, respiration ceasing first	36
Syncope, pulse ceasing first	11
	47

Mr. Lister declares himself a believer in the doctrine of death from too long-continued administration of the vapour. As between danger from failure of the circulation and from cessation of respiration, he is strongly on the side of the latter. Unfortunately he has adopted decided views in favour of the administration of chloroform from a cloth. He seems bound to prove that Snow was wrong in "assuming that when chloroform is given from a folded cloth, it is apt to be in too concentrated a form," and that most of the deaths that have occurred should be attributed to paralysis of the heart from the vapour being inhaled without proper dilution. He therefore writes too much like a partisan upon this point; worse still, he experiments like a partisan. For instance, he saturates a cloth with chloroform, suspends it before his face, notes the rate of evaporation as shown by a scale-beam to which the cloth is attached, but *inhales through a tube, from a distance*, instead of inspiring the air and vapour immediately about the nose and mouth, and claims that the inspirating current "does not

materially affect the rate of evaporation," and that the conditions are similar to those of a patient inhaling the vapour for surgical purposes![1] We think common sense will negative any amount of such experimentation.

These are his conclusions:—

"The theory of syncope from too great strength of the anæsthetic vapour when the cloth is employed being erroneous, the greater number of the deaths remain unaccounted for; and, if we except a very few instances for which we seem to have nothing to fall back upon but an idiosyncrasy so rare, that it may be practically left out of consideration altogether, their explanation will, I believe, be found in an overdose of this potent narcotic from too long-continued administration." (p. 99.)

Throughout Mr. Lister's remarks upon this branch of the subject, we find the early deaths ignored and the stage of stertorous breathing is looked upon as the only one in which the patient is in peril. To this stage of anæsthesia, or rather to the respiratory process during it, he has paid particular attention; he goes at length into an examination of the mechanism of stertorous respiration, and is a warm advocate of the efficacy of forcible pulling forward of the tongue as a means of "averting danger only." One very important point he insists upon is that stertorous breathing may "become aggravated till it passes into complete obstruction to the entrance of air into the chest, though the respiratory movements of the thoracic walls still continue." All this portion of the article is extremely interesting and of the very highest practical value.

Mr. Lister does not hesitate to carry his doctrines into practice, and boldly follows the path along which his conclusions lead him:—

"The very prevalent opinion, that the pulse is the most important symptom in the administration of chloroform is certainly a most serious mistake. As a general rule, the safety of the patient will be most promoted by disregarding it altogether, so that the attention may be exclusively devoted to the breathing." * * * "Even when serious disease of the heart is known to exist, it must be remembered that there is much less risk of syncope than of obstruction to the respiration." * * * "Preliminary examination of the chest, often considered indispensable, is quite unnecessary, and more likely to induce the dreaded syncope, by alarming the patient, than to avert it." (p. 105.)

We have now pretty fully presented the prevalent doctrines as to the mode of death under chloroform. If we were restricted to the choice of a single authority upon this point among those we have cited, it would be Dr. Anstie; his views are rational, supported by facts, and, so far as they go, satisfactory. But that there may be other modes of death, appears certain. There has always seemed to be a tendency to restrict the fatal influence of anæsthetics too exclusively to the *chest* organs; this is the great objection to Snow's theory, and to some others. Since the central nervous system has been acknowledged to be liable to a fatal influence from chloroform, whether from too prolonged or too rapid administration, there appears a like tendency to restrict the fatal influence to that part alone, ignoring other parts of this important system, equally important, and, in our opinion, equally influential in producing death.

There is one mode, in which we believe death may be occasioned, which we are surprised to see has not received any attention from writers upon this subject. We allude to death by shock, the fatal impression being a sudden influence upon the branches of the par vagum in the lungs, pro-

[1] See note to his article on pages 97 and 98.

duced by the inhalation of undiluted vapour of chloroform, this impression being transmitted by reflex action upon the heart. The pathological condition is Sansom's syncope from "loss of the irritability of muscle;" the cause, which he does not give, is, as we have indicated—a profound and sudden impression upon the peripheral extremity of nerves distributed through the lungs. He says this form of death is "*akin* to death from shock;" we say it *is* death from shock. Why not call it so? Certainly it is preferable to the adoption of the French word "sideration," a term much better adapted to concealing our ignorance than expressing our ideas, and far inferior to an English word which conveys a distinct idea to every medical mind, however little we may know of the ultimate pathology of the condition itself.

But will reason and the facts sustain this view? Let it be remembered we are advocating the doctrine that it is *one* of the modes of death, not the exclusive mode, but still, we believe, the most frequent one of all.

"There are two modes of death from chloroform—the first, *and most frequent*, sudden death at the early stage of its influence; the second, a gradual mode, the comatose state, etc." (*Sansom*, p. 72.)

It is to the first class alone the doctrine we have presented pertains. And, first, we say, it is consistent with analogy. That sudden impressions upon the peripheral extremities of nerves produce profound effects upon internal and vital organs is one of the best known facts of physiology. The cold water that, slowly applied to the hands and face, produces no perceptible influence upon a person, when dashed in his face causes immediately spasmodic efforts of respiration—catchings for breath, and consequent irregularity of the action of the heart. If it be objected that the effect is not profound enough to make the cases parallel, we reply that the exciting agency being increased in power, from water to chloroform, or the nerves affected by the agent increased in sensibility as from those of the external to the internal surface of the body, we may look for proportionably greater effect. But there is a more direct answer than this; half a pint of the same agent, water, drank ice-cold in certain states of the system has over and over again caused instantaneous death. Moreover, we say that in such cases death was caused by a profound impression upon the nerves of the stomach reflected upon the heart, and we call it death by shock. Again, the same is true of alcoholic drinks, between the effects of which and of anæsthetics there is so close a parallel; the brandy which, diluted and slowly drank, produces only intoxication, when drank clear and at a draught causes instant death. And we say, too, that this was death from shock.

This theory agrees with the manner of death. It is sudden; the inhalation seems going on well, when all at once the patient starts up or struggles a moment, or suddenly turns pale, and is dead; "like an electric current arrested in its course." Just so death from *emotion* takes place, and death from emotion is death from shock.

It explains the *early deaths*. Can as much be said for any other theory? We believe not. It is not necessary for death to be produced in this manner that the inhalation should have been long continued, nor that much chloroform should have been poured out for administration; the sole condition is that the patient should get a single inhalation of vapour entirely or nearly undiluted with air; the sudden impression on the vast ramification of nerves is made, transmitted, reflected, and death occurs. A moment of inattention on the part of the administrator, a hasty or incautious increase of the amount on the cloth or sponge, and it is done.

It will undoubtedly be advanced here that the air-passages do not bear with impunity very strong chloroform vapour, but coughing is produced, leading to temporary suspension of the inhalation. We admit the fact, but see no difficulty in it. It is only exceptionally, without doubt, that chloroform vapour of sufficient purity to produce the fatal impression can pass the glottis; yet that it *may* do so at any moment is clearly reasonable, for that the watchful guardians of this vital inlet to the body may be *surprised* we all know, or at least we use the term to explain to our satisfaction the fact that a solid body of considerable dimensions, even such a prickly object as a cockle-burr, can be drawn by a sudden inspiration into the larynx or trachea. So, exceptionally, may chloroform vapour of unusual strength gain access, and it is precisely this rare and exceptional occurrence of these early sudden deaths under chloroform which has rendered their explanation difficult.

This theory will explain the deaths which have occurred after previous safe inhalation of the vapour. That sudden death should occur to a patient who seemed from previous repeated inhalations beyond the possibility of meeting with accident was so singular a fact as to attract unusual attention, and numerous explanations were advanced to account for it; none of them were entirely satisfactory, and none of them, we believe, will cover the ground so fully as that of shock.

We have now to examine how such a view of the mode of death agrees with clinical experience. This is the final test of all medical doctrines, and one by which it must stand or fall. Reading over carefully the reports of fatal cases, it is surprising how frequently death occurred immediately after the increase of the amount of chloroform on the cloth or sponge or in the inhaler. We quote from Dr. Sabarth's Case 84;[1] the patient was a boy, the operation for double strabismus.

"Chloroform was administered upon a piece of lint and produced no unusual symptoms. After three or four minutes the operation was commenced, and, as signs of sensibility manifested themselves, a fresh dose of chloroform was applied. Scarcely had this been done when the countenance of the patient became deadly pale and the pulse, which was just perceptible, disappeared."

This is a type of many of the cases which can be found in the list of chloroform accidents. Looking over M. Perrin's list we find no less than nine which followed very closely this course.[2] It is not necessary to quote them; several can be found in Snow's list. We believe this explanation especially applicable to those cases where there has been a prolonged struggle between the anæsthetizer and the patient, either from timidity on the part of the one or from the latter being of that class of subjects, robust, muscular, and perhaps given to strong drinks—in which the stage of excitement is always longer and more marked than in others. After much time has been fruitlessly expended, patience is exhausted, and a new supply of chloroform is added intended to be sufficient to terminate the contest at once. It does so, but unfortunately in a manner entirely different from what was intended.

But there is also good authority to support this view; if our other positions have all been assailed, we will fall back upon that. Being a question appertaining to the nervous system, we may say that the authority we adduce is of the very higest character:—

"It is by the reflex influence due to the *sudden* irritation of the branches of

[1] From Medical Times and Gazette, Oct. 9, 1858.
[2] Cases xi., xii., xvi., xviii., xxvi., xxxv., xl., xlvii., lxvi.

the par vagum in the lung that chloroform has killed in the very rare cases in which the heart's action has been stopped before the respiration." (Brown-Séquard, *Lectures on the Physiology and Pathology of the Central Nervous System*, p. 160.)

The eminent physiologist is speaking of animals, yet notably, they are more difficult to kill with chloroform than man; so much so, that it is denied by most writers that they can be destroyed at all by the influence of the agent on the heart, and maintained that they always die by failure of respiration from prolonged administration of the vapour. If true of animals, it certainly is true of man.

We do not know that Dr. Brown-Séquard has ever written more fully upon this view of death by chloroform than the few lines quoted above. If he has ever elaborated the above paragraph in any article or work, we have not met with it. Yet brief as is this statement, so consistent is it with reason and with clinical experience, and so high the authority from which it emanates, that we can furnish no explanation of its being entirely ignored by every author who has written upon anæsthesia from the time it appeared in print until the present.

But death may still take place by shock, the initial impression being different—a sudden and profound excitation of the nerves on the cutaneous surface of the body. The able authority we have just quoted gives some striking examples of a sudden suspension of the heart's action from such a cause, and looking over the list of fatal chloroform cases, we find abundant additional evidence. In quite a considerable number of the cases death followed immediately on the first entrance of the surgeon's knife. This was the case in the only instance of death seen by Mr. Lister, already alluded to; the patient started and died as a single sweep of the knife amputated the penis. The author alludes in a note, briefly, to Mr. Bickersteth's observations and opinion, which are given more fully by Snow (p. 240). This gentleman relates three instances in which the pulse suddenly ceased as the first incision was made by the surgeon, and then in a few seconds recovered itself; and he believes that the stoppage of the pulse was the effect of the shock of the incision. Snow dissents from this opinion, and thinks it more probable that the cessation was caused by the profound influence of the chloroform. Nevertheless, Snow's own report of the case of diseased heart, observed by him, where lithotrity was performed with and without chloroform, and which we have already mentioned, is a striking example of the influence of a peripheral excitation, or pain, upon the regularity of cardiac movements.

M. Perrin considers, at length, the influence of the intervention of the surgeon in producing death, and admits its importance, although with him the fatal event is brought about by "syncope." He notices Mr. Bickersteth's observations, and also the investigations made by M. Vigoroux to elucidate this important clinical fact.[1] The conclusions of this gentleman are that the influence of the sensory nerves upon the circulation exists even during the anæsthetic sleep; that it appears to be augmented; that it may be of such degree as to arrest the movements of the heart; and that this was the cause of the majority of deaths from chloroform. Now, as M. Perrin justly remarks, since less than half of the deaths occurred "during the operation," the latter conclusion cannot be true, and he arrives at what we fully believe to be the true solution of this matter; it is only in a certain stage of the anæsthetic process that the sensory nerves can exert this influ-

[1] The reference is to "De l'influence de la sensibilité sur la circulation pendant l'anæsthesia chirurgicale."—*Comptes rendus de l'Académie des Sciences*, t. lii. p. 201.

ence upon the circulation; during *incomplete anæsthesia* the heart's action may be thus affected, when it is *complete* the source and origin of the impression, sensibility, is abolished.

"Observation in man confirms this view. We have taken the pains to watch the state of the pulse in eight patients during the entire duration of anæsthesia, and we have seen that at the moment of excitation, whether initial or repeated, it marked the reactions indicated by M. Vigoroux, even upon the occasion of slightly painful impressions, the pricking of the suture needle for instance. But, confirmed anæsthesia, as we have defined it, once obtained, the pulse does not betray, in any manner, the *contre-coup* of the operation. The circumstances under which the accidents have happened witness the same thing. Of the eighteen cases of sudden death occurring during the operation, there were ten in which the anæsthesia was manifestly incomplete." (p. 413.)

We think this will answer a question which we could not fail to anticipate, and which, most probably, some of our readers have already put. What is the good of all this minute inquiry as to the exact mode of death by chloroform, and which has so much the appearance of pathological hair-splitting? It is answered, in part, by the latter portion of the above quotation. If there is any possible way of avoiding a death it should be known, understood, and practised upon, and the plain, practical lesson from the above is, that *complete anæsthesia is better than partial.* Better, because safer; a *little* chloroform, so often mentioned, is like a little learning, a "dangerous thing," while full doses carry their own protection from evil.

So in regard to the other channel by which a fatal influence is conveyed to the heart, death occurring from a profound impression suddenly made upon the ramifications of nerves in the lungs. The practical lesson is plain; avoid the danger by a slow and careful administration of the agent. Everything goes to show that it is the *sudden* impression of the agent which causes the shock, and this being understood the danger can be easily avoided. This danger is acknowledged and taught by most of the authors under notice, and it would be manifest injustice not to mention the fact. We have differed from them as to the *modus operandi* of the agent in producing death, but we could not express any more clearly the recognition of danger in sudden interruptions in the inhalation, or warn any more distinctly against them.

"Rapid and *brusque* inhalations, in which a large quantity of chloroform is given at once, are particularly injurious. First they may poison the patient; but this is the least danger, since it is easily avoided. The greatest objection to them is that they act upon the nervous system by shocks and jerks."

"Experience has demonstrated that among all preventive measures the most important is to proceed with the inhalation very slowly, avoiding all sudden disturbance, all shock to the nervous system." (*Perrin*, pp. 410, 411.)

"In the case of strong atmospheres the danger is due, not only to the quantity of chloroform present, but to the rapid and sudden influence produced." (*Sansom*, p. 83.)

"I am quite sure that the danger of chloroform is not proportionate to the quantity retained in the system—it is its early influence, the 'brusquerie' of its action which has caused the great part of its fatality." (p. 84.)

"Commence the inhalation gradually. Use no force if it can possibly be avoided. * * * Recollect that any sudden increase in the strength of the vapour may produce sudden syncope." (p. 134.)

The latter quotation is from his chapter on the "practical rules for the administration of chloroform," than which we do not know a better chapter in any book of any language; it is a safe guide for the practitioner

whatever views may prevail as to the particular mode by which death is caused.

It will have been observed, without doubt, that the tendency of the doctrines we have advanced is to bring the deaths from chloroform to the door of the administrator. We accept the conclusion, for we think it cannot be escaped. Deducting those cases in which emotion played the chief part in producing the fatal event, and those in which the anæsthetic was but one of the "factors," we believe the others were nearly, if not quite, all due to mal-administration. The vapour was given too rapidly, of too great strength, too suddenly, or, in rare instances, for too long a period. The facts sustain this view; the number of deaths from self-administration, the number in the hands of unskilled administrators, as dentists, the manner of death, the circumstances of the administration, the symptoms in cases where death was threatened, but did not take place—all concur in placing the chief responsibility upon the mode of administration and the dose of the remedy. Authorities support this view, and have always done so. It was the essence of Snow's theory that death resulted from too large a percentage of chloroform in the blood, and might always be avoided by restricting the amount. But the fault of his theory was that it took no account of the rapidity of inhalation as bearing on the question of death, and we have seen how very important a part is played by sudden changes of the rate of administration. The authors whose works are under notice generally sustain this view. Sansom says: "It is very certain that want of caution has had its influence in the production of the fatality;" and again "some of the deaths would not have occurred had the chloroform been cautiously and fairly administered."

This doctrine is distinctly inculcated by Mr. Lister. He is trying to account for the deaths having been so much more numerous when the anæsthetic was administered for trivial operations:—

"When some great operation is to be performed, like the amputation of a thigh or the removal of a stone from the bladder, plenty of well qualified assistants are present, and each of them, including the giver of the chloroform, is duly impressed with the importance of his office, and bestows the requisite pains upon it. But when some trifle is to be done, the whole affair is apt to be regarded too lightly, and the administration of the anæsthetic is perhaps confided to some unsuitable person who also allows his attention to be distracted by other matters."

Dr. Ellis says: "It is, however, only too probable that a still larger proportion of the fatalities laid to the charge of chloroform, might more correctly be ascribed to the mode in which it was given."

There is a table in Dr. Anstie's work from which can be drawn an argument bearing upon this question. Dr. A. has had twenty-one cases in which alarming symptoms occurred out of a total number of 3,058 administrations, or 1 in about every 145! a most surprising proportion, and one which, if generally observed, would, we believe, soon pretty nearly do away with anæsthetics altogether! We felt compelled to try and find an explanation of so singular an occurrence, and one differing so widely from general experience. We think we have found it in the columns which give the dose of the remedy and the period at which the symptoms occurred. From one to three drachms was the quantity; none less than a drachm; too large a dose, we maintain, to be safely commenced with from lint or a handkerchief. In Case 5, ʒj was given on a handkerchief, and the alarming symptoms began in less than half a minute; in Case 8, ʒij were given, and the symptoms began "after a very few deep inhalations;" in Case 11, ʒj

on lint, and "after a few inspirations," Case 14, the same exactly; and so on. Is it possible not to connect the alarming symptoms with the mode of administration in these cases? We think not, and we find in this curious table, the like of which we do not believe could be furnished by any other person, several most important practical lessons and strong evidence in favour of the doctrines we have maintained in this article.[1]

It seems to us passing strange that the influence of the mode of administration in occasioning death should have been so generally ignored by writers on chloroform. Reluctance to advance any doctrine likely to cast blame upon members of the profession may have contributed to this, and it would be laudable were blame the necessary consequence, which we cannot admit. But even if it were, it should have no influence in a question of science. Whatever the explanation, the fact remains the same; every explanation seems to have been preferred to this. Now there are three *elements*, so to express it, entering into the process of anæsthesia—the remedy, the patient, and the mode of administration. An impure article of the remedy was maintained as the cause of death as long as it could be; then everything faulty on the part of the second element, the patient, was advanced; idiosyncrasy, diseased heart, and, worse than all—when patients died after having previously inhaled it with safety—the doctrine was brought forward that persons did not always respond alike to its influence! The third element seemed forgotten, yet it is not only likely to be uncertain, but one positively impossible of being uniform under the most usual mode of procedure. The vapour of a liquid is administered whose rate of vaporization differs so much at ordinary temperatures as to be double at one time what it is at another;[2] the liquid is poured by guess on a handkerchief or towel, and held at varying distances before the mouth and nose of a patient, whose rate and depth of respiration vary from moment to moment! And yet, when death occurs, it is assumed, generally, that this process is a uniform unvarying thing, and the deviation from the normal course of events is looked for in the impurity of the remedy or some condition of the patient!

It is chiefly by a more careful administration that we believe children have so generally escaped accidents with chloroform. That they are not absolutely secure we have seen, while numerous theories have been advanced to explain their great proportionate immunity. None of them are entirely satisfactory, while some undoubtedly express a portion of the truth, which is all we will claim for this one. As Mr. Lister maintains a greater bestowal of care upon every step of capital operations, and seeks in that way to account for the greater safety of patients anæsthetized for such a purpose, so we seek in the tenderness of the child-patient, the evident weakness of the trembling form compared with the strength of the giant we hold in our hands, an explanation of its safety under chloroform. The absolute, pressing need of caution and care are forced upon our attention with a power which it is impossible to escape.

It is not consistent with the operations of the human mind that so serious a matter as danger from chloroform should exist without various and persistent attempts being made to remedy it. Different propositions have been made for this purpose from time to time. The first we examine is

[1] This table is quoted by Sansom, but the amount of chloroform given is omitted —a most important point.

[2] "Air at 40° Fahr. can retain 6 per cent. of chloroform vapour; at 60°, 12 per cent." (*Sansom*, p. 22.)

the substitution of ether for chloroform. That the stronger agent acts more promptly, more pleasantly, and that with it anæsthesia is more easily as well as more rapidly produced, is not denied by the advocates of the weaker, and the sole question to be decided is as to the relative amount of danger in the two. It is claimed by the advocates of ether, by some of them at least, if not by all, that it is essentially harmless—that no well-authenticated case is on record in which death can fairly be attributed to this agent. This claim cannot be allowed upon the testimony of the authors before us. Dr. Sansom alludes to nineteen cases of death from ether, as collected and published by Trousseau; the details are wanting, yet the high authority for the statement will generally be considered a sufficient voucher for its truth and justice. Dr. Sabarth quotes the second of the conclusions of the Boston Society for Medical Improvement—("It is a generally accepted fact that ether is less dangerous than chloroform")—and adds the following paragraph:—

"Thirty-six cases of death from ether are known to have been collected, so that in proportion to the frequency of the administrations of chloroform, and of the much less frequent use of ether, the number is a very large one." (p. 154.)

He believes that chloroform will remain the principal anæsthetic.

M. Giraldes, in the *Dictionnaire*, examines this question at considerable length. He decides, *a priori*, that the inhalation of ether cannot be absolutely free from danger, and that in claiming that it is so the medical societies of Boston and of Lyons have advanced a proposition "much exaggerated." He finds this decision supported by the facts; he examines the cases given by the Boston Society, and says: "This collection of facts, to the number of twelve, show well that the ether has been one of the factors, if not the principal factor, which has occasioned the death;" and thinks the "American surgeons, devoted partisans of ether, carry their enthusiasm too far." Upon the persistent attempts which have been made to explain away the agency of the ether in bringing about the fatal result, he makes an excellent point:—

"We are obliged to remark, that if in examining the accidents attributed to chloroform, the same vigorous method had been pursued as has been followed with those attributed to ether, assuredly we should have arrived at a diminution of the number of the mortal accidents which cast a shadow over its history."

M. Perrin gives the details of three cases of death from ether. Following the same rules of examination which we should do in regard to chloroform, we reject two of them as not fair cases. In one, at Lyons, the patient was very feeble and prematurely aged, and was advised not to inhale the ether; in the other, at Bellevue Hospital, under Dr. Alonzo Clark, a post-mortem examination revealed a tumour in the right lobe of the cerebrum. The third case we consider an undoubted case of death from ether.[1]

There is another clear case of death from ether on record in this country. We allude to the case reported by Dr. W. H. Mussey, of Cincinnati.[2] If the agency of the anæsthetic has been successfully explained away in this case, we have not met with it. Dr. Sabarth copies it into his work without expressing any doubts.

[1] The references in M. Perrin's work are carefully given, with the exception of this case! It is not stated where it occurred, or under whose care! The reference is to *Journal Connaissances Méd. et Chir.*, 1842—the date evidently a typographical error. The patient was a Bavarian, it was in an hospital, and Charrière's instrument for the ether was used.

[2] Cincinnati Lancet and Observer, January, 1861.

The relative danger of the two agents then is a point difficult to determine, impossible without figures, which cannot be obtained. Our belief is, that did we know the total number of inhalations of chloroform with 200 deaths, and the total number of etherizations, allowing only the two undoubted cases of death mentioned, the ratio of deaths in the latter would be fully equally to that of the former. The general verdict of authorities is that ether is less likely to occasion death than chloroform, because a weaker agent, and, therefore, better for careless or inexperienced administrators. In our own opinion it is impossible to occasion death by shock with ether; not only a possible but probably a frequent mode of death by chloroform. In this respect the two agents differ just as wine differs from ardent spirits. Enough of the former could not be drank off at once, or would not produce a sufficiently profound impression upon the nerves of the stomach to produce the instantaneous death sometimes caused by the latter. But so far as utility and the demands of practice are concerned, the question has been emphatically decided by the profession—it is pretty nearly Boston and Lyons against the civilized world. Nor do any of the reconsiderations which are from time to time urged upon the profession affect the decision: "As the matter now stands, the use of chloroform is increasing, that of ether diminishing." (*Sansom.*)

The doctrine of Snow that death was alone caused by breathing air too highly charged with chloroform vapour leads directly to the use of an inhaler, an instrument which would always regulate the amount of vapour administered, as a preventive of accident; and since his time there have now and then appeared advocates of inhalers, who would fain make the profession believe such an apparatus to be indispensable, that his own instrument is the best, and by the use of which all danger can be avoided. So little effect, however, has been produced upon the profession, in this country at least, that inhalers might be dismissed without a moment's consideration. As Dr. Sansom, however, again appears as the advocate of an apparatus, and as it appertains to the subject, we give it a passing notice. Among the authors under review we find Sansom, Ellis, and Anstie in favour of the use of inhalers, and Lister, Sabarth, Giraldes, and Perrin opposed to them. The objects to be obtained by them is the insurance of an atmosphere of uniform and moderate strength, not containing above a certain percentage of vapour, Dr. Anstie gives 3.5 per cent., and thinks such an instrument would insure the perfectly safe administration of chloroform. Dr. Sansom has invented a special inhaler, constructed with two principles in view—a definite dilution of the vapour and a gradually increasing strength of it, and thinks he has improved upon Snow's, although in regard to Mr. Clover's instrument he expresses himself as considering it "the safest method of all for the administration of chloroform." Mr. Clover's plan is to use a bag large enough to contain the air for the respiration of several patients during inhalation; into this is introduced sufficient chloroform to give accurately a strength of 4.5 per cent., and, by means of a valve near the mouth-piece, even less than this is administered at first. The bag is attached to the coat or around the neck of the person giving the anæsthetic, and is, of course, costly, cumbrous, and formidable in appearance to timid patients. In Dr. Anstie's opinion, too, this is the best apparatus, although Sansom's inhaler had not been presented when his book was published.

The argument in favour of inhalers made by the chloroform committee, based upon the fact "that not less than 80 per cent. of the fatal accidents with chloroform have arisen when it has been given on a handkerchief,

lint, or sponge," we do not consider of any weight, because the number of administrations without an instrument so vastly exceed those with one. Any argument in favour of them, based upon economy in the amount of the anæsthetics used, is unworthy of a moment's consideration. None can certainly be founded upon their superior convenience, for all of them require special study and care in their management. This is especially the case with Dr. Ellis's, an ingeniously contrived instrument for insuring definite amounts of vapour from several fluids of different rates of vaporization, probably well effecting the end in view, but complicated, according to his own testimony, requiring study, and, we believe, utterly impracticable in daily life. It will not do, especially for Dr. Sansom, to base any argument upon the number of times any one of them has been used without accident, for we should turn against him his own reply to those who claim special immunity from accident on account of having followed some special mode: "If you had given chloroform ten, or even twenty thousand times, and had then met with a case of death, you would but have received your just proportion according to recorded cases." The only satisfactory proof would be absolute immunity from accident when an inhaler was used; unfortunately this cannot be furnished. In Dr. Anstie's table of 21 cases in which alarming symptoms occurred, Snow's inhaler was used twice, alone. Another important fact is learned from this table, as well as elsewhere; in one case Weiss's inhaler was used, but was "out of order!" That the mechanism of tubes and valves may become deranged, and thus introduce a new element of danger into the process, is an important fact, and a most serious objection to all these instruments.

"The employment of inhalers is not only an embarrassment in practice, but we will go further, and say that it introduces a cause of danger." (*Giraldes.*)

"Inhalers have also their sombre list. * * * In the sixty cases in which the manner of administration is indicated an inhaler was used twelve times. * * * Thus in one-fifth of the fatal cases a mechanical apparatus was employed, a proportion which is very considerable when we take into account the limited use of them. * * * It suffices for us to draw this conclusion, the immunity promised in their name remains thus far a Utopian idea. It is a philanthropic dream, but it is only a dream." (*Perrin*, p. 461.)

If we needed any more authority, we should find it in the practice of the most eminent surgeons of the world; those who use chloroform the most frequently, administer it in the most simple manner. Velpeau, Larrey, Cloquet, Nelaton, Caseaux, Jobert, Huguier, Simpson, Syme, Druitt, Erichsen, all reject inhalers. We will not say that there is no such thing used in this country, but we certainly do not know, and have never heard of a surgeon in America who uses them, nor of a respectable authority for their use.

But, in spite of all this testimony, if the question were simply between an inhaler and the most frequent mode of administering chloroform, upon a handkerchief, thick towel, or some article nearly impervious to air, we should prefer the former, believing the latter to be the worst possible plan. There are elements of safety in inhalers; they secure definite dilution of the vapour, and prevent those sudden irregularities and shocks with the vapour, which play so important a part in the production of danger; hence, they are certainly safer in unskilled hands. With the exception of Mr. Lister, the testimony is unanimous as to the evils of administration from a handkerchief:—

"The great objection to the administration of chloroform on a handkerchief is its irregularity—the utter ignorance we have of the strength of the vapour

inhaled at a given time. At one moment a quantity of air strongly impregnated with chloroform may enter the lungs; at another, a breath may be taken of almost pure atmospheric air." (*Sansom*, p. 79.)

This we know from personal trial; a mere change in the position of the handkerchief may give a whiff of the vapour which is overpowering. Add to this the widely different rate of vaporization of chloroform at varying temperatures of the atmosphere, and the great irregularity of this mode of administration is manifest. The article upon which the chloroform is sprinkled should be porous, and sufficiently so to admit of free respiration through it, and which will insure the entrance of the vapour to the lungs well mixed with air, and not in *strata*. Nothing meets the necessities of the case better than sponge; not a flat or round piece, upon which the liquid is poured and held under the nose, but a cup-shaped piece, fitting over the respiratory orifices. Such a piece, well squeezed out of water, a few drops of chloroform sprinkled on it to begin with, and pressed gently so as to carry the anæsthetic to all the interstices through which the air will pass, affords the best possible instrument for everyday practice. If any one, accustomed to the use of a napkin or handkerchief, will try this plan, we feel confident he will be surprised at the ease and regularity of the production of anæsthesia, and the small quantity of the liquid used.

The use of a mixture of anæsthetic vapours as a means of escaping the dangers of chloroform, is the proposition at present attracting the most attention, and one, we believe, which deserves the most careful consideration. Such mixtures have always been more or less used, but the Report of the Chloroform Committee of the Medico-Chirurgical Society of London first distinctly and unequivocally declared their superiority, and placed upon their use the seal of authority. This was so recent that it is only in the latest works of our list—those of Drs. Sansom and Ellis—that we find any adequate mention of the subject. M. Perrin gives an account of the only death known to have taken place under a mixture of ether and chloroform. The case occurred in this country, and was reported in this journal for July, 1857; the patient was a child five years old, the operation removal of a tumour, and four ounces of blood were lost during the operation. That the principles of administration were not as well known then as now is very certain, and may be fairly urged in reference to this case, even were there no unfavourable "factors" present, a severe operation and loss of considerable blood for a patient of that age.[1]

The object of anæsthetic mixtures is the avoidance of danger, especially of that danger arising from the depressing influence upon the heart's action which chloroform most certainly exerts, which ether does not exert, although the evidence is insufficient to convince us that it stimulates the heart, as alcohol certainly does. The committee proposed three mixtures:—

A.	Alcohol	1 part.
	Chloroform	2 parts.
	Ether	3 parts.
B.	Chloroform	1 part.
	Ether	4 parts.
C.	Chloroform	1 part.
	Ether	2 parts.

The introduction of alcohol is a novel feature in one of these, and Dr. Sansom gives the credit of originating this mixture to Dr. Harley. There

[1] Snow does not hesitate to say that the patient died of hemorrhage.

is no doubt that the alcohol plays a very important part in addition to and independent of its stimulating effects, either by modifying the influence of the others, or in affecting their vaporization, or both. The committee says it is by "the uniform blending of the ether and chloroform when combined with alcohol, and probably the more equable escape of the constituents in vapour." Dr. Ellis says "the chloroform is, after all, the potential agent; the others are chiefly adjuvants;" * * * "vehicles and diluents of the chloroform." Dr. Sansom[1] gives strong testimony as to the stimulating effects of this ingredient, counteracting the depressing influence of chloroform:—

"In my own experiments I have found that alcohol has had the greatest effect in sustaining the heart's action during the influence of chloroform. I can particularly recollect one instance in which alcohol, having been administered in vapour to a frog, it was impossible to cause death by any strength of chloroform vapour. I certainly think that a dilution of chloroform with alcohol is advisable in many instances, and I am quite sure that the administration by the stomach of a little alcoholic stimulant acts beneficially." (p. 140.)

Dr. Ellis has made the administration of mixed vapours his special study, and is their especial advocate. He believes that anæsthesia by this method "has been proved to be the safest, the pleasantest, and the best, in its total results." A large part of his small book is taken up with experiments upon the differing rate of vaporization of the fluids and the means he has tried to equalize it. In this he claims to have succeeded as well as in devising an apparatus which insures the administration of a larger than usual amount of the vapour of alcohol. In everything relating to these parts of the subject his work is very complete, and his reasoning is good.

The objections urged to anæsthetic mixtures are: 1. The length of time required for the process; 2. The probability of sensibility not being abolished (Sansom); and, 3. The unequal rate of vaporization of the fluids (Ellis). The first two cannot, in our opinion, be sustained. The third "introduces a new element of danger." It was first advanced by Snow. He says when ether is combined with chloroform "the result is a combination of the undesirable qualities of both agents, without any compensating advantage," and that there is great danger because the operator, towards the end of the process, may be giving pure chloroform when he thinks he is giving the weaker mixture of vapours. So positive a judgment by such eminent authority postponed the use of mixed anæsthetics in our hands for many years. Still, the facts of unequal evaporation, and consequent danger remain the same. Dr. Ellis says:—

"Out of the six or seven minutes occupied by the evaporation of the half drachm of fluid, the first was occupied chiefly by the ether, the next three by the chloroform, with a little alcohol, and the last by the alcohol alone. In an inhaler, the patient would have breathed, for one-fifth of the time, chiefly the vapour of ether; for the next three-fifths, that of chloroform with a little alcohol; and at last only the vapour of a minute quantity of alcohol." (pp. 24, 25.)

We fully recognize the danger, then. But it is precisely one of the best of dangers; if we are allowed such an expression. Best, because being

[1] Dr. Sansom has lately advocated, before the Obstetrical Society of London, a mixture of equal measures of chloroform and absolute alcohol, as "an excellent anæsthetic, which gives off a proportion of chloroform vapour in a given time, almost exactly half of that which is given off by chloroform pure and simple." It is this mixture, we understand, which was employed some years since in the Massachusetts General Hospital under the name of chloric ether.

known it is easily avoided; the only precaution necessary is for the operator to squeeze out his sponge napkin or lint from time to time during the administration, and make a fresh application from the bottle.

Our own experience with mixed vapours, and we have used only mixture A, has been exceedingly satisfactory. Our experience has not been great, but we have never been much longer in producing anæsthesia and have never failed of making it perfect. One case which fell under our observation afforded an opportunity of contrasting the effect of the mixture with that of undiluted chloroform and presented a striking instance of its superiority: A young man, muscular and robust, from appearance probably a moderate drinker, presented himself at our office with dislocation of the shoulder of five weeks' standing. Before attempting reduction he was placed under chloroform, and the symptoms were by far more unpleasant than we had ever before or since met with. The struggling was great, the suffusion of countenance extreme, the respiration irregular and catching, and the veins of the neck and face turgid with blood; it was only with the greatest caution that we carried him to the stage of complete relaxation. The attempt at reduction failed, and in an hour or so he consented to a second attempt. This time we resorted to the mixture, and the contrast was striking; he went under its influence with no more than ordinary difficulty, if as much. The influence of the previous administration of chloroform in changing the patient's condition—the only "element" in the case which could be modified—we cannot estimate very highly, and therefore look upon it as a fair instance of the comparative effects of the mixture, and pure chloroform.

In our opinion anæsthesia by mixed vapours is destined to increase in use and in favour with the profession. The method seems especially adapted to cases in which the operation is likely to be of some duration, or accompanied with much hemorrhage, or other depressing circumstances, and those who believe in inherent and unavoidable danger in chloroform should by all means resort to it.

But whatever anæsthetic may be chosen, ether or chloroform, the pure article or the mixtures, and whatever instrument or mode of administration may be preferred, nothing will obviate the necessity of *care* in the administration of these powerful agents. This is at once the teaching of reason, of experience, and of the best authority. They have been too long and too frequently intrusted to unskilled hands, a dresser or student, and the wonder is that death has not oftener occurred. Happily, this custom is passing away, and the necessity for careful study of the subject is fully recognized.

"We believe we shall render a veritable service if we vulgarize this idea that anæsthesia should be observed and studied at the hospital with as much care as every other subject of practical medicine." (*Perrin*, p. 417.)

"The administrator should be experienced. It has been in some cases a custom to intrust the chloroform to a young dresser—one who might be more anxious to watch the progress of the operation than the stage of the narcosis. This is a state of things to be deprecated, and several hospital committees have acted wisely in appointing a Chloroformist—a measure which is not of less value to the operating surgeon than it is of benefit to the patient. One who administers chloroform in any case should confine himself exclusively to the task he has undertaken, and should constantly mark the symptoms." (*Sansom*, p. 131.)

There is no one point attention to which alone constitutes care in administering anæsthetics There are three indices of danger—the pulse, the respiration, and the countenance; attention to all of them is necessary, for a change in one or the other has always marked the appearance of alarming symptoms.

"The administrator should observe the countenance, the respiration, and the pulse. There has been too much dispute as to which should receive most attention. Some writers have urged attention to the pulse to the exclusion of the breathing, others *vice versa*. The truth is, to my mind, that all the signs should receive attention—none more than the others." (*Sansom*, p. 134.)

The only exception to the inculcation of such doctrines is Mr. Lister. We have already seen that he neglects attention to the pulse, and we regret to find that he fails to impress that caution which we believe to be so necessary, and that his language is such as to allow the student to infer that, after all, anæsthesia is a trifling process, requiring neither special study nor experience.

With this exception we know of no authority which does not urge in the strongest terms the necessity for caution in the administration of these agents. Even M. Sédillot, who promulgated early in the history of anæsthesia, and ever since, the doctrine that "chloroform, pure and well administered, *never kills*," is careful to teach with it that anæsthesia "is an art which requires attention during every moment, much skill and experience," because "every time chloroform is administered life is at stake."[1]

Drawing our work to a conclusion and surveying carefully the ground we have passed over, we ask, what is really the amount of danger? how high shall we estimate liability to accident, the one drawback and objection to anæsthetics? It cannot be given in figures, but must be estimated, and find expression in general statements. We draw the conclusion that it is very small indeed from Mr. Lister's article alone. He pursues a mode of administration which we believe to be faulty in the extreme, does not teach very strongly the necessity of special study or experience, has evidently seen a vast number of administrations, and yet has no fear whatever of the agent. He says "it may be used so as to be practically free from any risk whatever;" and we think he furnishes himself the strongest illustration of the fact!

Dr. Anstie does not place the estimate higher, although he has witnessed one death from it, and met with alarming symptoms far more frequently than falls to the lot of most men. He does not hesitate to counsel its use upon every occasion. In the following extract the italics are his own:—

"It is my firm persuasion that, with proper care, chloroform may be safely administered *to any patient who is fit to undergo an operation at all, whether there be any existing disease of heart, lungs, or brain, or not.* I have never allowed the known existence of such disease to prevent my administering it, and I have never found any evil result. I entirely concur with Dr. Snow's opinion on this subject." (p. 384.)

Dr. Ellis, a special pleader for the superior safety of mixed vapours, speaking of the danger from chloroform, says:—

"The risk is, of course, small; all statistics go to exhibit that important and reassuring fact." (p. 1.)

We translate from Dr. Sabarth's preface:—

"From a statistical point of view it must be confessed without restriction, that the evil consequences of this wonderful agent, whether of temporary duration or fatal nature, appear minute when compared with the innumerable multitude of fortunate results which almost every country of the civilized world can show, and can scarcely be considered of any weight in the decision of the question."

[1] See an article in Cincinnati Journal of Medicine, Aug. 1866, translated from *Gaz. des Hôpitaux*; and his *Médecine opératoire*.

M. Perrin, who believes, as we have seen, that there is and always will be danger in chloroform inhalation, and that our chief advance will be by learning better to whom to give it, speaks hopefully of the future:—

"We are making progress; we have made it in the past and shall continue to do so in the future, and the mind can foresee the time when the skill of the administrator will enable him to escape every evil predisposition." (p. xiii.)

Sansom says:—

"I believe that the facts warrant the conclusion that the dangers of chloroform have been exaggerated." (p. 10.)

"From all the considerations I have advanced, I think the following conclusions may be drawn: That though chloroform has in many instances caused death, it has not the fatal power which might at first sight appear. That, excluding the various chances which all chloroformed and not chloroformed must submit to, by utilizing our increased knowledge, and exercising an increased care, we may deprive it of all its terrors." (p. 17.)

The amount of danger is not only small but, more important far, it is in a great degree preventable. Probably we shall continue to have deaths from emotional causes so long as the human mind continues what it is; so long as the body remains what it is we shall have those deaths in prolonged operations where chloroform is "one of the factors" in producing it. But with "our increased knowledge, and exercising an increased care," we look for the others to disappear from the annals of medicine. Nothing will tend so powerfully to promote this result as a careful study of the chloroform literature of the present. Not only will such a study increase the frequency of its use until the axiom of Syme is generally accepted, that "every case for operation is a case for chloroform," but it directly and powerfully adds to the safety of the patient and the comfort of the operator. No contrast can be greater in either respect than that between an administrator of anæsthetics, who is timid, and justly so, because he is a believer in the pernicious doctrine that no reliance can be placed in the regularity of their action, and one who is imbued with the doctrines that irregularities of action arise from irregularities of administration, who has confidence in his remedy and feels that he has the power to control it. The one dreads the arrival of the hour for the inhalation, and thanks his stars when it is safely over; he is fearful, and administers the vapour irregularly; while the patient, escaping the dangers of inhalation by jerks, is exposed to those arising from incomplete anæsthesia, and the surgeon is annoyed and baffled in his manœuvres by the struggles of partial sensibility. The other proceeds steadily but cautiously to the end in view; he "makes haste slowly," and with a boldness tempered by wisdom carries his patient down into the dark valley which borders on death, drowns human agonies in the waters of Lethe, and triumphs in the crowning glory of his art.

If the present of anæsthesia is cheerful and satisfactory, the future, too, looks bright and promising, and we cannot close without calling attention to the fact. The number of agents known to produce anæsthesia, the extent to which they are being tried, and the amount of attention directed to improving this branch of our art, all give evidence of farther advances in our knowledge. We think no one can rise from a careful study of the present condition of the subject without feeling convinced that we shall not much longer be limited to the agents now known, and that the day is not distant when, to quote the eloquent address of Mr. Bowman to the British Medical Association, "in the sure progress of our art, some other anæsthetic shall be found without even the slight inconveniences of chloroform."

J. C. R.

ART. XIV.—*On the Structure and Growth of the Tissues, and on Life.* Ten Lectures delivered at King's College, London. By LIONEL S. BEALE, M. B., F. R. S., Physician to King's College Hospital, Professor of Physiology and of General Morbid Anatomy in King's College, London, &c. 12mo. pp. 219. London: Robert Hardwicke, 1865.

THE cellular composition of tissues, and the cellular theory of their development and growth, in one or other of its accepted forms, have been so long admitted by physiologists, while the more recent interpretation of this theory, and its application to pathological structures by Virchow have been received with such universal favour, that any theory which militates against it cannot but startle those who have settled into its acceptance, and must have a stable foundation to be permitted to displace it.

Founded, as is the theory of Beale, upon his own personal observations—observations which carry on their face the impress of truth and reliability, it has seemed to us that his ideas have not attracted that attention from American physiologists which they deserve. Having trained himself to most accurate execution with the pencil, Dr. Beale makes all his own drawings, and no one who has examined the cuts in any of his carefully prepared works, as those accompanying the lectures on the tissues as first published in the *Archives of Medicine*, those in either of his valuable books *How to Work the Microscope*, and *The Microscope in Clinical Medicine*, or the illustrations to his more recent labours on the direction of nerve currents and distribution of ultimate nerve fibres to muscular fasciculi, can fail to be convinced of the skill and accuracy with which his drawings are made. Nor are we compelled to rely upon our comparison of the labours with our own ideas of what they should be, for we have been informed by a medical friend who has recently had the advantages of Dr. Beale's teachings, and who saw the original microscopic appearances, that the drawings represent them most truthfully.

If there be error, then, in the theory of Beale, which we do not deny (our object being merely to make its principal points more accessible to American medical men), it must be in the train of reasoning rather than in the premises, which appear to be true.

That the theories of Beale and Virchow are opposed to each other, in a greater or less degree, is plain; but the exact nature and degree of difference we fear is not appreciated by many of our countrymen. And it shall be our aim, in the following review, to indicate, as far as possible, the points and degree of difference.

Dr. B.'s first lecture contains an enumerative review of the organic functions with brief definitions, and a slightly more extended consideration of the nature of the process of *nutrition, i. e.*, "the manner in which the soluble material, which is brought into relation with a living tissue, is taken up by that tissue and incorporated with it; how it becomes converted from an inanimate into a living substance; how the whole organism grows; how tissues increase in size until the adult form is attained; how the waste resulting from action is supplied by the production of new tissues." The difficulty of answering such questions as these is admitted, and in many cases the impossibility of conclusive answer. "But by reasoning upon facts obtained by experiment, and upon the observations derived from very minute examination of the tissues with the highest powers of the microscope, inferences which in many instances probably approximate the truth,

have been obtained." The importance of a consideration of the theories advanced for the explanation of these phenomena is manifest from the fact that of late these matters have been discussed, not only in scientific books, but even in the current literature of the day. Hence medical men are at any time liable to be called upon to give an opinion regarding various points connected therewith. An additional reason for the study of these theories lies in the fact that it is impossible to know anything of the action of the body in health without investigating the minute changes which go on in the organism. "This knowledge forms the foundation of physiological science, and from this point of view the changes taking place in disease can alone be studied with any advantage. It is the natural introduction to the study of medicine." Still another reason adduced by Dr. Beale for the earnest study and advancement of every branch of science bearing upon medicine is the influence which increased knowledge must exert in exposing the false character of the many plausible arguments which are brought forward in favour of various forms of quackery. His remarks are so eminently applicable to the circumstances by which we are now surrounded in our own and every American community, and involve so entirely the only remedy for their removal, that a quotation of the entire paragraph is justified, though somewhat irrelevant to the strict purpose of the lecture.

"It is quite clear that if the principles upon which we act were as capable of proof as many of the general doctrines of chemistry, quack dogmas would very soon be exposed; but charlatans know well that the arguments from which our principles of action are deduced cannot be understood by any one ignorant of physical science, while by putting forward false premises, and drawing from these a logical conclusion, they very easily convince even an intelligent, well educated man, who is unable or disinclined to analyze their premises, that there is some reason in their statements. Depend upon it, gentlemen, the only efficient way of opposing the spread of quackery among the public is to encourage the spread of scientific investigation and a love for research among ourselves, and by this course alone shall we be able to shame those amongst us who are base enough to their profession to support and pamper an impostor or encourage a stupid system of treatment because they have not the courage to offend the prejudices, or oppose the caprices of some self-willed, wealthy, and, perhaps, influential person. We must oppose the spread of quackery, and endeavour to prevent the harm resulting from it, by increased devotion to our profession, by prosecuting researches for the discovery of new truths, or for confirming facts which appear inconclusive, and by unremitting efforts to demonstrate simply and most conclusively the soundness of the fundamental principles of medicine. The skill of the modern chemist exposes the vicious refinements of the most ingenious and subtle poisoner; and in the same way our earnestness and gradually increasing knowledge of disease must ultimately destroy the influence which unscrupulous charlatans have long exerted upon ignorant persons." (pp. 6–7.)

Next follows a brief exposition of "the cell and other theories," premised by the admitted proposition, "*all living structures spring from pre-existing living structures.*" Again, all living structures are perpetually undergoing change; they grow, are nourished, exist for a time, and ultimately die. They possess the power of assimilating to themselves lifeless matter, and communicating to it the same peculiar properties with which they themselves are endowed; and, further, they possess the power of multiplying themselves infinitely, of giving rise to other organisms which inherit similar properties to those which their progenitors possessed. The exact method in which all these changes are accomplished has been the object of the various theories referred to.

The accepted theory of cell origin, viz.—that cells are produced from pre-existing cells by division—is too familiar to the readers of this journal for it to be necessary to enter into any details concerning it; while the theory of aggregation advanced by Schleiden and Schwann having, with the exception of Dr. Bennett, of Edinburgh, few advocates among eminent physiologists, we need not stop to discuss it here.

The theory propounded by Wolf, as recently modified by Huxley, is briefly described:—

"This theory supposes that the organism at the earliest period of its existence consists of a clear semi-fluid material. Soon certain changes occur in this; spaces or vacuoles which have the appearance of cells are formed. In these again, nuclei appear. The growth and multiplication of these spaces is effected by changes in the surrounding substance—by the surrounding material *growing* in towards its centre, and separating the vacuole, cell or space, into two parts." (p. 10.)

According to Beale, the chief difference between these two theories is that in the former the cell is the active part, while in the latter it is the *intercellular substance* which is active.

Beale says that in the organism it is certainly true that there are structures composed of bodies resembling cells; but contends that there are also tissues whose origin from mere cells it is not easy to make out.

"In fibrous fasciæ, tendons, and ligaments, for example, we have a tissue containing here and there nuclei; but it is impossible to demonstrate in it at any period of its existence bodies which might be fairly termed cells. In the structures which apparently correspond to cells in some tissues, there is no cell-wall, hence they have been termed *nuclei*, while it is believed that the material, the fibrous tissue in which they lie, is formed altogether independently of these." (p. 10.)

So in the case of many other tissues; without enumerating any, however, he contends it is difficult to conceive how the cells were formed, and to explain how, by any changes occurring in the form of such cells, existing structures could be produced; and that while the formation of some tissues is therefore intelligibly explained, by the cell and other theories, there are others to which their application is exceedingly unsatisfactory, and entirely inadequate to account for existing appearances. While admitting this statement of Beale—especially in the application of the cellular theory to the so-called intercellular substances as illustrated by the hyaline intercellular substance of pure cartilage, to explain the formation of which, it is totally inadequate—it is but justice to Virchow to state that the modification of his views with regard to the essential character of the cell wall, *does* admit the application of his theory to the formation of a larger number of tissues.

The nature of this modification is given by a correspondent from Berlin to the *Edinburgh Med. Journal* for February, 1865, in which the writer states that "Virchow personally expressed to him that he *now did not regard a cell wall as an essential part of the cell* as given in cellular pathology; but that a nucleus surrounded by a molecular blastema was sufficient to constitute a cell; that the outer part of this cell blastema consolidates and forms a cell wall, as Beale has shown, and that this takes place in the amœba when thrown into fresh water." It will only be necessary for the reader to remember these statements when we come to develop the theory of Beale, to be convinced that the gap between the two theories is very much diminished by their admission.

The better to appreciate his own observations, and the train of reasoning based upon them, Dr. Beale asks us to dismiss, for the time being, all theories, and consider with him the changes actually seen to take place in the growth of various organisms, when examined under the most favourable circumstances, under the highest powers of the microscope.

Taking a little of a deposit of phosphate of lime as an example of inorganic matter, and placing it under the microscope, we find it presenting the appearance of a "number of minute granules possessing no form or structure whatever." Magnified by the highest powers you will indeed increase the size of the particles and bring others into view, but still there is no appearance of *structure*. Certain oscillatory *movements* are also observed among these particles, the so-called *molecular* movements first described by Mr. Robt. Brown. These particles being inorganic, the movements can be the result of physical forces alone.

Next he supposes a small fragment of dead animal or vegetable matter to be placed in a few drops of water on a glass slide and under the microscope. The water appears clear as the slide upon which it rests. Next place both these slides under the same conditions for a few hours, allowing free access of light and air. Then examining each again, the one containing the inorganic deposit of phosphate will be unchanged, except perhaps so far as an aggregation of some of the particles may have taken place. The second slide in which the organic material was mounted, before perfectly clear, now contains an additional number of minute granules, closely resembling those of the phosphate of lime, and manifesting similar molecular movements, suspended on either slide by the addition of a little gum, glycerine, or other viscid material, and recurring on dilution with water; indicating that in both cases these movements are due to physical causes.

Again, let both slides be set aside for a few hours, then re-examined, when we shall find the slide containing the inorganic matter still unchanged. But not so with the slide containing organic material. "The granules have increased considerably in number. Many have become altered, or their place is occupied by little bodies, some of which have a circular, others an elongated form, but all exhibit a remarkably simple structure." On the elapse of more time the change still continues. "The little bodies have become larger; in fact, they have grown, and have, moreover, considerably increased in number. It is easy to make out in the largest particles that *the central portion differs from the exterior*; in fact that each is composed of at least two substances, or a substance in two different states." Further examination of one of these will show these substances to consist externally of a delicate membrane, and within of a material having a granular appearance. These changes, it will be remembered, have taken place only in the organic or living particles placed under conditions favourable to the development of simple living organisms, and at a certain period the granules on the two slides could scarcely be distinguished, and they have been derived, not spontaneously, but from pre-existing living beings, in accordance with the law stated early in the lecture. And the compositions of these structural particles corresponds exactly with the compositions of the elementary parts of the higher animals. The external investment is the *formed material* of Beale; the granular material within is his *germinal matter*.

In further illustration of the structure of the simplest living organisms, Dr. Beale supposes the microscopic examination of a little ordinary mildew, the elementary parts of which are larger than those we have been

examining. It will be observed to consist of a number of little round bodies, each having a *tolerably thick, well-defined outline*, while the *interior presents numerous small particles like dots*—the *two parts*, one externally, transparent, arranged to form an investing membrane, closed at all points, the other within, granular, and presenting no form. In these bodies, too, under favourable circumstances, certain changes will occur. Placed upon the moist surface of a glass slide and allowed to remain for a time, they first absorb moisture and swell up, and the membrane appears thinner than before, while the granules have increased in number. Second, "a new change is observed; at one point in the membrane a small orifice is formed, through which a little of the granular contents of the body covered with a thin layer of the inner part of the membrane passes, and thus a small nodule is formed which projects from the external surface of the membrane." This increasing in size gradually assumes a structure like that of the parent body; the membrane around it becomes thicker, and the attachment less, until complete separation takes place; when it becomes "an independent organism exactly resembling that from which it sprung, and capable of giving rise to new individuals like itself by a repetition of the process by which it was formed."

Other similar methods of multiplication of particles are admitted by Dr. Beale. In these an orifice forms on the membrane of the particle of mildew, and a little of the granular material escapes, but it does not separate as in the first case; it remains in connection with the mass, and grows out into a narrow thread-like process. The membrane on the external surface becomes thickened, and the whole increases in breadth. Within are contained a number of little spherical bodies or spores, like those observed within the circular body from which the process has grown. It may be that as this process grows, at one or more points a thinning occurs in its wall, and a portion of its contents coming into more immediate contact with the pabulum increases in amount, and thus gives rise to the production of another process or processes growing from and exactly similar to the first."

We have been thus particular in detailing the method of multiplication of living particles as given by Beale, because it is one of the points in which his theory differs somewhat, but not totally, from the "cellular theory" as held by Virchow. They evidently coincide as regards the source of the new body—always from a pre-existing organism; but while the cellular theory multiplies by duplication and reduplication of the original cell or elementary part, that of Beale makes the process more nearly allied to gemmiparous reproduction, by a budding from the original parent.

In both, the active agent is the whole or a part of the substance within the membranous investment, the cell contents and nucleus, according to the cellular theory, the *germinal matter* of Beale; while the membranous investment, the cell wall of Virchow, *formed material* of Beale, is passive. The *germinal* matter, descended from germs, is constantly producing germs. The *formed material*, inert, is formed from the germinal matter; hence the term applied by Beale.

It is the property of the germinal matter removed from any organism recently alive to be stained by an ammoniacal solution of carmine with glycerine, while the formed material is not thus stained; or if it be stained, owing to too great strength of the solution used, the stain is removed by soaking in glycerine, while the stain of germinal matter is rendered permanent by preservation in glycerine.

Thus a very convenient aid to study results from this property, without which it would be impossible, in every instance, to distinguish the matter which corresponds to the substance within from the external envelope of the mildew. "Every *elementary part*," which is the term Dr. Beale prefers to substitute for the ordinary word cell, "of every living organism may be considered to consist of matter in these two different states: *Germinal matter*, which, from inanimate nutrient material, will produce new germinal matter, and which becomes converted into *formed material;* and this latter substance which was once in the state of germinal matter."

The so-called *nuclei* and *nucleoli* of cells, which are stained of a deeper red by carmine than the surrounding germinal matter, Beale considers simply as new points of germinal matter, just converted from inanimate nutrient material, which passes in from without and becomes incorporated with the living granular substance by conversion into it. The new matter is not produced by deposition upon the external surface of the investing membrane, but is produced through the agency of the germinal matter in the interior. Were the former the case, the external membrane would become thicker and thicker as the growth advanced, while the central portion would remain unaltered; whereas, we find that as growth proceeds, the wall in most cases becomes considerably thinned.

The external membrane or formed material is in every instance the oldest portions of the elementary part, and the inner surface of the membrane is younger than the exterior. The formed matter of which the membrane covering the mass is composed was once granular germinal matter, and resembled that in the interior; but the particles composing it have passed through various stages of existence, and now no longer possess those wonderful properties which belonged to them at an early period of life—the power of communicating vital properties to inanimate matter. It is passive; dead.

The second lecture is devoted to further illustration of the theory and its application to the higher animal tissues.

"The organism is made up of different tissues, and these tissues are composed of *elementary parts*. Each elementary part consists of *germinal matter* and *formed material*, which was once in the state of germinal matter and formed from it." (p. 26.)

The first application is made to *cuticle*, of which the oldest portions are known to be on the outside, and the most recently formed nearest the blood, the source of their nutriment. Microscopically, the different characters of different parts are readily noticed. That nearest the vessels consists of small masses of germinal matter closely approximated. Nearer the surface the masses have a more definite arrangement, each consisting of an oval body with an external membrane. Still nearer the surface the elementary particles appear more or less flattened, and a larger quantity of formed material (cell wall) is present, while at the surface the elementary parts present hardly any indications of germinal matter, and seem entirely composed of cuticular substance (formed material).

This is the history of the growth of cuticle according to our author:—

"Here is a little mass of germinal matter, which grows and thus divides into two, each of these subdivide, and so on. Now each of these little bodies absorbs nutriment from the surrounding fluid. It increases in size. The older particles on its surface are altered and appear to be converted into a hard substance which is improperly described as membrane (cell wall). As it approaches the surface of the body the hard material becomes thicker and thicker, forming

the cuticular substance, until at length the germinal matter in the centre having nearly all undergone conversion into formed material, and being too far removed from the source of supply to increase at the same rate, the remainder perishes; by this time the elementary part in the form of the flattened scale of cuticle has reached the surface of the body, and is to be removed." (p. 28.)

Tendon, as the type of another class of tissues, is next selected for the application of the theory. Composed principally of so-called white fibrous tissue, under a power of two hundred diameters, a portion of fœtal tendon is seen to be made up of oval masses of germinal matter, with a certain proportion of intervening fibrous structure. Earlier in its existence it contained a larger proportion of germinal matter, and if its growth be watched, the fibrous material will be found to increase, while the germinal matter relatively diminishes, until in the adult tendon there is principally fibrous material, the germinal matter being present in very small quantity. This fibrous material is the formed matter which has undergone conversion from the germinal matter, which at this period is situated at regular intervals throughout the tissue, having the appearance of nuclei, and corresponding to the connective tissue corpuscles of the cellular theory. It is through these masses that the inanimate nutrient material is converted into fibrous matter. At the outer part of each is a layer of soft tissue in a transition state. It has ceased to be germinal matter, and is about to become tendon.

The application of the theory to the development of nerve fibre, as attempting to elucidate a subject of some obscurity, is interesting. The difficulty of the investigations is admitted, and it is only in the terminal distribution of the nerve fibres that the structure of the elementary part is to be made out. These fibres, as distributed to the elementary fibre of voluntary muscle, contain numerous oval masses of germinal matter, situated at short distances from each other, along the course of the fibre :—

"In an early stage of the growth of the fibre the masses of germinal matter are very close together, but as the growth of the fibre proceeds, the distance between the oval masses is increased. The germinal matter probably forms new tissue at either of its extremities, so that as the quantity of formed material is increased, the masses of germinal matter are farther and farther removed from each other. Hence, an elementary part of nerve fibre may be represented as an oval portion of germinal matter with an exceedingly delicate fibre projecting from each side of it." (p. 31.)

The third lecture is occupied principally with the consideration of the changes occurring in elementary parts, resulting from altered conditions of growth, and illustrated by the phenomena of the blister and formation of pus. To which are added some remarks on white blood-corpuscles and pus-corpuscles, and the process of secretion.

The lecture is opened by an apt illustration in a comparison of the process of crystallization, with the formation of living structures, according to the author's theory, which needs but to be referred to, to be appreciated at once. The two processes, instead of being similar are directly opposite, the former being the result of external deposition, while the latter occurs by internal deposit.

The changes occurring in elementary parts resulting from the change of the conditions under which they grow, are the causes of the different forms and properties of the various structures of the body, as well as of the changes which are the result of disease. The surface of the skin, for example, is perfectly smooth and even in health, because a balance of the

two opposite processes of *removal* and *repair* is maintained. We have already seen that in cuticle there is a constant addition of new particles at its deep aspect, and these gradually pass towards the surface, increasing in size as they pass outwards, while the old particles on the outer surface are constantly being removed. So long as these two processes keep pace with each other, the normal condition of the skin is maintained. But suppose the skin, supplied with improper pabulum, or not supplied at all, a deviation from the balance results; old matter is removed from the surface, but nothing new may be produced to supply its place. Such a change occurs in scarlet fever:—

"The morbid matter circulating in the blood interferes with production of new cuticle; for a time none is formed, but by and by when the violence of the disease abates, and the poison is in a great measure eliminated from the blood, the formative process is re-established. A gap, however, exists, as it were, between the tissue formed before the interference of the disease, and that produced after the natural process was resumed. In point of age they are separated by an interval, so that as the new cuticle grows up from below, the old is separated *en masse*. We may suppose that some change of this sort occurs in those creatures which, at regular periods, shed their skins." (p. 42.)

So the formation of tissues having peculiar properties depends upon the powers of the germinal matter. All tissues are formed from germinal matter, and though germinal matter presents everywhere the same appearance, it possesses different properties in different situations. Thus, the germinal matter of cartilage produces cartilage wherever placed, that of bone forms bone wherever transplanted; in illustration of which we have the well-known fact that though bone itself be entirely removed, if the germinal matter capable of producing it is allowed to remain, new bone will be produced. Hence the surgeon desires to leave the periosteum intact in the exsection of diseased bones, that new healthy bone may be produced. Certain morbid actions illustrate the same truth, one of which is the so-called "bone cancer." Certain minute particles, the germs of the growth, pass into the blood, and are carried by that fluid to different parts of the body; so minute, that they pass through the smallest lymphatics and capillaries; so great their vital properties, that when arrested in any part of the circulation and deposited in any tissue they take root, grow, and give rise to a structure resembling that from which they have been derived. So are maintained the peculiar properties of muscle, nerves and of secreting organs.

The process of secretion is illustrated by that of the liver. Though the ordinary diagramatic representations of the liver cell make it a well defined round or oval body, containing a nucleus, in reality no such regularly formed body exists, while some of the cells have a very irregular outline, often angular, and sometimes ragged. Nor can the constant existence of a cell-wall around the so-called liver-cell be demonstrated. Hence the cell-wall is not a necessary part of the cell, and Dr. Beale prefers to speak of it rather as an elementary part, consisting of a mass of formed material and germinal matter.

"The germinal matter (nucleus) contains separate centres of growth, smaller masses of germinal matter (nucleoli) growing and appropriating to themselves new material, and capable of becoming a structure like the whole mass, so that all might be destroyed, except the nuclei and nucleoli, and these, retaining their vitality, would commence to grow anew." (p. 50.)

The mode of secretion of bile he thus explains:—

"The material from which the bile is to be formed transudes from the blood-

vessels; it is absorbed into the interior of the mass constituting the 'liver-cell.' Here it is converted into the material of which the germinal matter is composed. The particles of this mass are constantly growing from centre to circumference, and when they have reached the circumference of the mass, having passed through various stages of existence, they become bile. So that in secretion the same rule is observed that we noticed in the growth of tissues. The conversion of new material begins at the centre, germinal matter is the form which it first assumes, and the particles of this substance towards the end of life give rise to particular tissues, or, in the process of secretion, to the peculiar substance which is resolved into the constituents of the secretion." (p. 50.)

I have been thus particular to give the author's precise words, that no misconception of his meaning can, if possible, arise. The easy applicabilities of this theory to other secretions, as the milk and urine, will, of course, be perceived.

According to Beale, the *white corpuscles* of the blood, *pus-corpuscles*, *corpuscles of the lymph and chyle*, and *the contents of the closed glands* are to be regarded as masses of germinal matter possessing the powers of growth. Hence their resemblance, though their powers are very different. The white corpuscles are prevented from undergoing any process of development into tissue by the constant motion to which they are subjected. If stationary from any cause, they give rise to the formation of a simple kind of fibrous tissue—"indeed, there is reason for believing that *fibrin is the formed material of the white blood corpuscles.*" So when lymphatic glands are enlarged and the quantity of fibrous tissue increased, Beale believes that the fibres in the substance of the gland are formed from lymph corpuscles. The peculiar tail-like appendages of many white corpuscles in the spleen, familiar to all microscopists, he believes to be the result of initiatory steps in the formation of fibrous tissue—they are formed material converted from germinal matter.

The formation of pus is illustrated by the phenomena of the blister. When an ordinary blister is applied, the skin swells, fluid is poured out beneath the surface of the cuticle, between the two layers, and the superficial layer is pushed up. If the deep surface of this layer be examined it will be found to consist of a number of elementary parts, each having a thick outer wall, with a central portion of germinal matter very distinct. In the subjacent fluid, too, a number of such particles will be found floating separately. If the irritation be kept up some time, we obtain, as is well known, a viscid fluid holding in solution a vast number of bodies composed almost entirely of germinal matter, and having a very thin investment of formed material, growing and multiplying rapidly. *These bodies are pus-corpuscles:—*

"The effect of the irritation is such that the elementary parts of the cuticle are produced with greater rapidity than in the normal state. Nutritive material is supplied from the blood, and in greater abundance than usual, and this must be converted into living material. * *
The nutritive material, then, is converted into germinal matter in the ordinary way, but so rapidly do subsequent changes occur that there is no time for the gradual production of cuticle. The elementary parts of cuticle are formed by a process of slow and gradual transformation of germinal matter as it grows old, into cuticular substance; but in the morbid state produced by the irritation of the blister, this gradual transformation cannot take place, and elementary parts consisting almost entirely of germinal matter, with very little formed material, are alone produced. Flakes of very soft spongy structure resembling cuticle are first formed, and these give place to the development of the substance we know as pus. In the process of healing, the order of the change is reversed.

The formation and multiplication of germinal matter gradually diminishes, and time is allowed for the proper cuticular material to be formed." (pp. 45–6.)

A sufficient number of examples have now been drawn from the different structures of the body to illustrate the formation of tissues from germinal matter, so that the remaining lectures, principally devoted to the development of individual tissues in detail, will be passed over in more rapid review. A few words only with regard to the *embryo*, which Beale considers as consisting "almost entirely of germinal matter, the separate masses of which divide and subdivide until the basis of each tissue is laid down. Then the oldest particles of the germinal matter of each mass become converted into the particular substance of which the tissue is to consist." We could wish this subject of the human ovum to have been more fully discussed. No reference is made to the germinal vesicle and spot of the egg, their origin, or the part they perform in the development of the embryo. The whole subject would be more complete had the egg been made the typical elementary part, if such it is considered, and the theory further illustrated by reference to it, as it is made the typical cell in the theory of Virchow.

The fourth lecture is occupied with a consideration of the ultimate microscopic constituents of tissues, with a view to a correct and uniform terminology which should be observed in writing and speaking of microscopic appearances, a matter of very great importance, as much misinterpretation of views has been the result of a careless use of terms. These are *granules* or *molecules*, *globules*, *fibres*, *perfectly clear*, *transparent*, *and structureless membrane*, *nuclei*, *nucleoli*, and *cells* or *elementary parts*.

The first is the *granule* or *molecule*, defined by Beale to be "a particle which is too small to exhibit any form or structure when examined by the highest magnifying powers we possess. It appears as a very minute *dot* or *point*." Granules may be simple or compound, organic or inorganic, living or dead. *Living particles*, under favourable circumstances, *grow*, not by aggregation, but each individual particle increases in size by absorbing matter which surrounds it, and causing a complete alteration in the properties of this matter. Living granular matter can always be positively distinguished from inanimate granular matter by the ammoniacal solution of carmine, which stains the former, but leaves the latter uncoloured. The living particles tend to separate or divide, in obedience to a power resident in living matter which compels the particles to move in a direction *from the centre*, where the matter of which they are composed became living. The *inanimate granular* matter may be albuminous, fatty, or saline, albuminous being dissolved by acetic acid or alkali, fatty by ether, and saline by water, acids, or alkalies, according to the nature of the substance.

A *globule* is defined to be "a body which appears under the microscope circular, with a dark outline and transparent centre." They are generally spherical, but may be oval or irregular, and vary much in size. They, too, may be albuminous, fatty, or mineral, but the term is only properly applied to bodies of the above character of like composition throughout. The same tests indicate their composition. The thickness of the outline of a globule depends upon the difference between the refractive power of the matter of the globule itself and that of the medium in which it is immersed. The greater the difference the thicker the outline.

A *fibre* is defined as "anything which appears as a mere line, or solid and thread-like with a double outline." A fibre thick in the centre, and gradually tapering into thin lines at the two extremities, is called a "fibre-

cell." Any tissue exhibiting lines parallel to each other, and exhibiting regularity, or arranged irregularly, crossing and interlacing in various directions, is said to exhibit a "fibrous appearance." This may be due to mode of formation, or produced artificially in some perfectly clear substances by the addition of chemical reagents.

Transparent membranes are not defined by Beale, most probably because the term membrane conveys to the minds of all moderately informed readers what it is intended to indicate. Yet there is an evident incompleteness in the paragraph, in consequence of the absence of definitions, whereas each of the other microscopic elements is defined. There is manifest difficulty in defining accurately a term so commonly used, and yet the various applications of the term would seem to call for a definition.

Examples of structureless membranes are often seen in the so-called "cell-wall," and the walls of capillary vessels. Appearances of a transparent membrane may also be produced artificially by the application of chemical reagents.

The remaining elements, *nuclei*, *nucleoli*, and *cells* or *elementary parts*, form definite masses which possess vital endowments, are therefore characteristic of living beings, and present a definite structure.

Our author defines a *cell* or *elementary part* to be "a structure always consisting of matter in two states—*forming* and *formed*, or *germinal matter* and *formed material*. The first or active substance is surrounded and protected by the outer passive matter, through which all pabulum to be converted into germinal matter must pass."

It will be remembered that the ordinary definition of a cell is that it is a perfectly closed sac having certain contents, among which is essentially a nucleus, but that, in accordance with the modified views of Virchow, who is looked upon as the exponent of the cellular theory, it does not materially differ from the cell or elementary part as defined by Beale.

"*Nuclei* and *nucleoli* are new centres which are developed in pre-existing living matter." Mere oil-globules should not be mistaken for nucleoli. Nuclei and nucleoli, as already stated, are always darkly coloured by carmine, while oil-globules do not receive the colour at all.

The fifth lecture is devoted to the anatomy and properties of *tissues*, of which Beale attempts no specific classification, because of the apparent impossibility of suggesting at present a classification which would assist the student. The usual classification—into, 1. Cell tissues; 2. Connective tissues; 3. Contractile tissues; 4. Nervous tissue—is given.

The so-called *soft connective tissue* is referred to as that soft silky fibrous structure serving as a connective medium between other tissues, and to support higher structures;—the *firm*, as illustrated by white fibrous tissue, and *hard connective* tissue, as seen in bone and dentine. Beale desires to show that the distinction commonly thought to exist in all these tissues, of *cells* and an intercellular substance, does not actually exist, and that the so-called "intercellular substance" has not an independent origin, but corresponds to "the wall" or "formed material" of an "epithelial cell." And here appears to us the strength of Beale's theory, contrasting favourably with the weak point of the cellular theory, so called; for it is in accounting for the intercellular substance of the connective tissues that the cellular theory is strikingly inadequate, while that of Beale explains most satisfactorily its presence.

The anatomy of tendon is first described, his specimens being made, not in the usual method, from desiccated tendon, but from moist tissue,

thus obviating any changes which may be produced by drying and re-moistening.

The relation of the formed material (white fibres) to the germinal matter (connective tissue corpuscles) was given in illustration of the theory in review of lecture I.

Beale considers the "canalicular system" of stellate cells and communicating tubes for conveyance of nutrient juices, as demonstrated by Virchow, to be dependent upon an alteration produced in the nuclei or masses of germinal matter, and upon the displacement and tearing of some of the young tissue connected with them; these the result of pressure and other necessary violence in making sections and other manipulations. "In the dead tissue they may be called tubes, but they are *artificial tubes*, and do not convey nutrient juices during the life of the tissue."

So with regard to the delicate fibres of yellow elastic tissue encircling the bundles of the white fibrous tissue of tendon, which Virchow considers tubular, and forming a part of this nutrient system, Beale has again and again failed to demonstrate any such tubular character.

It is well known that perfect white fibrous tissue is rendered transparent by acetic acid, and that yellow elastic tissue resists its action. Yet not all fibres which resist the action of acetic acid are yellow elastic tissue. The imperfectly formed fibrous tissue (nuclear fibres), or that portion of the formed material immediately joining the germinal matter, and which is not, therefore, perfectly-formed "formed material," also resists the action of acetic acid. This fact has caused observers to conclude that nuclear fibres are elastic tissue, which is erroneous. And it must be remembered that nuclei generally resist the action of acetic acid, and we use this reagent so much in anatomical investigations because it possesses the property of rendering fully formed tissue transparent, and thus the nucleus or germinal matter, and recently formed matter around it, become much more distinct.

Again, though white fibrous tissue, or all intercellular substance, is thus acted upon by acetic acid, it does not follow that this intercellular substance is produced in the same manner, possesses the same chemical or physical characters, and performs the same offices, in whatever organism or whatever part of an organism it may be found. True elastic tissue, such as is found in the ligamentum nuchæ, ligamenta subflava, chordæ vocales, &c., is always connected with and developed from nuclei; but there are many fibres ordinarily considered yellow elastic fibres, as the fine fibres encircling the bundles of fibrous tissue of tendon, and the nuclear fibres alluded to, which are not true elastic tissue. The first, according to Beale, are probably the remains of vessels or altered nerve-fibres, while the latter are recently produced formed material.

The *cornea* is treated of at this point as a modification of white fibrous tissue. Beale considers the so-called connective tissue corpuscles of the cornea, which are considered by Kölliker and Virchow cells for the distribution of nutrient material, simple masses of germinal matter, continuous with the fibrous tissue, and directly concerned in its formation.

The consideration of the fibrous tissues is continued in the sixth lecture. In the mucous tissue of the umbilical cord, where Virchow maintains the existence of special nutrient channels which anastomose with each other, and thus form a system of communicating tubes for the conveyance of nutrient materials, Beale fails to discover anything like such an arrangement. According to Beale, this mucous tissue of the umbilical cord

. . . "consists merely of a soft form of connective tissue, in which the fibres correspond exactly to the fibrous tissue of ordinary tendon. The interspaces between the finest of the fibres seem to be occupied with soft transparent granular matter.

"The fibres, with the numerous nuclei, are for the most part arranged to form the boundaries of more or less circular spaces. In the spaces are seen more delicate fibres, arranged without much regularity, and the nuclei are much less numerous in the central part of the space than they are amongst the fibres which bound it. As the tissue grows, the formation of new fibres takes place at the circumference. The nuclei of the older fibres die, and a great part of the fibrous matter itself is gradually softened and disintegrated; so that the circular spaces are gradually increasing in diameter as the tissue advances in age.

"An elementary part of this tissue consists of an oval mass of germinal matter, with ragged fibres projecting from either extremity, and often extending for some distance. Many of the elementary parts are triangular, and the fibres pass off in three directions. The fibres have the general appearance of ordinary connective tissue, and the germinal matter extends for some distance in opposite directions, gradually tapering into a very thin line, which is at length lost among the fibrous tissue. In the fresh tissues, therefore, there are no communicating tubes and lacunæ, as Virchow has described. What appears to be a space or cavity in the centre of the elementary part, is really occupied with germinal matter, and the apparent tubes contain prolongations from this imperfectly formed soft fibrous tissue. This soft germinal matter breaks down very soon after death, and thus spaces and tubes may result. These tubes do not exist as channels in the tissue during life, and the nutrient matter *permeates every part of the tissue, instead of flowing through any special channels.*" (pp. 91–2.)

We have thus quoted, almost entire, the remarks of Beale on this subject, because, as he remarks, Virchow regards this structure as one which especially favours his own view, and conclusions formed must necessarily influence our views upon the process of nutrition generally.

The *vitreous humour* is considered by Beale as a form of very delicate fibrous tissue, the fibres of which are combined with a very large quantity of water. Upon the inner surface of the hyaloid membrane, which is continuous with the vitreous humour, round masses of germinal matter exist, which are separated from each other by pretty regular intervals, and from them a very soft tissue can be traced into the vitreous, with which it is in fact continuous. To these so called cells the vitreous humour bears the relation of formed material to germinal matter in other situations.

According to this view, the oldest part of the vitreous humour is in the centre, while the circumferential parts are last formed, though Beale thinks it probable that this structure during life undergoes very slow changes indeed.

The seventh lecture is devoted to *adipose tissue* and *cartilage.*

Adipose tissue is generally associated with areolar tissue, and the fat vesicles lie in the spaces which exist in the areolar tissue. *Marrow* is a very pure form of adipose tissue.

The fat-cell, or vesicle, is the "elementary part" of adipose tissue. The fatty matter in adipose tissue is always situated within a very thin membrane, which is indeed a good example of a cell wall, though the young fat-cell has neither fat nor cell wall. The fat is formed and deposited in the substance of the granular material of which the fat-cell in its early stage is composed. The deposition of the fatty matter may be compared to the deposition of starch and some other deposits which Beale calls "secondary deposits," found after a certain period of growth, has been reached in some vegetable cells. But the fatty matter is not

only deposited from a solution, but it is *formed*, and may be produced, though no fatty matter is taken with the food.

"At an early period of development, we observe a number of oval or spherical masses of germinal matter (nuclei) in those positions where fat is to appear. These divide and subdivide as in the development of other tissues. The collection is freely supplied with capillary vessels. If the tissue be stained with carmine, each mass is coloured darkly in the central portion (nucleus), and external to this there is a layer of granular matter only faintly coloured. The latter gradually increases, and amongst the granules, a number of small oil-globules make their appearance, or only one is to be seen. * * The fat gradually increases, and soon occupies the greater part of the 'fat-cell,' which now consists of a large globule or several small globules of fatty matter, and a thin layer of granular matter around this, which is much thicker in one spot than elsewhere, and there the original nucleus is situated. The granular matter undergoes condensation at its outer part, and becomes the clear transparent cell-wall, or vesicle, and in the fully-formed fat-cell, the nucleus will be situated between the fat and the wall of the cell. As long as the nucleus or mass of germinal matter remains the fat may go on accumulating in the interior." (pp. 107–8.)

This fat Beale considers to be formed by a conversion of the granular or germinal matter of the elementary part. In this way also are produced the deposits of fat in liver-cells and the so called cartilage-cells.

With regard to cartilage, the greatest difference of opinion exists as to its essential structure and mode of formation. It is generally supposed that cartilage consists of *cells* and *intercellular substance*, and many contend that each cartilage cell possesses a very thin wall or capsule distinct from the cartilage matrix. By others, among whom is Virchow, it is considered that the soft granular matter just within the cell wall corresponds to the primordial utricle of plants. Beale contends that the cell wall cannot always be demonstrated as distinct from the matrix, which is sometimes absent, sometimes contains fibres resembling yellow elastic tissue, and in fibro-cartilage resembles white fibrous tissue. According to Beale, in the development of cartilages—

"The masses of germinal matter at first are very close together; they divide and subdivide as they lie in the soft formed material, and, as development proceeds, become separated from each other by gradually increasing intervals. At the same time, the formed material undergoes slow condensation, and the formation of new material on the surface of each mass of germinal matter more than compensates for the shrinking of the matrix, which would otherwise be manifest. Each of these masses of germinal matter divides and subdivides, and formed material is produced on the outer surface of each, so that there are small collections of masses of germinal matter separated from each other by a considerable extent of formed material in the shape of fully-formed cartilage, while the separate masses composing each collection are themselves separated from each other by a very thin layer of recently produced and much softer formed material." (p. 113.)

According to our author, then, the matrix of cartilage is simply the formed material of the germinal matter constituting the so-called "cartilage cells," and corresponds with the cell wall or membranous capsule, of which the primordial utricle or inner membrane is only a younger portion.

This is evidently different from the teaching of Virchow, according to whom the membranous wall of the capsule *sends in septa* when the cells it contains undergo division, which serve as new envelopes for the young cells, yet in such a way that even the gigantic groups of cells which proceed from each of the original cells are still inclosed in the greatly enlarged parent capsules.

The eighth lecture is devoted to *bone*, which has been carefully investigated, but in which much still remains undetermined.

In bone the *formed material* is impregnated with calcareous matter, in such manner as to produce a very hard, unyielding tissue, which, however, possesses a certain amount of elasticity. The observations of most histologists are based upon the examination of *dried* bone, whereas they should be based upon the examination of *living* or *recently dead bone*. To this former method, Beale thinks may be attributed the difficulty of giving to the student a correct notion of the structure of bone and teeth. According to Beale—

"An elementary part of *fully-formed* bone consists of a mass of germinal matter, surrounded on all sides by, and continuous with, a thin layer of soft formed material, which passes uninterruptedly into the hard calcified formed material (matrix or intercellular substance of authors). This hard material is penetrated everywhere by very fine channels (canaliculi) through which the nutrient material passes towards the masses of germinal matter. An elementary part of bone at *an early period* of formation consists of a mass of germinal matter, surrounded by a certain proportion of granular homogeneous or more or less fibrous formed material. This last becomes the seat of deposition of calcareous matter, which proceeds from *without inwards*, and the *formation of the canaliculi takes place in the same direction*. * * An elementary part of fully formed *dead* and *dried bone* 'consists of a space (lacuna) occupied in the recent state with germinal matter. Numerous pores or channels (canaliculi) pass from one lacuna to adjacent lacunæ.' In the dry bone lacunæ and canaliculi are both occupied with air, and in consequence of the great difference in refractive powers between the air and the bone tissue, the cavity and tubes appear black." (pp. 123–4.)

The *canaliculi*, according to Beale, are not processes of a cell, but *altered spaces* which are left between the calcareous globules originally deposited, and through them pass fluids to and from the germinal matter. The portion of the canaliculus first formed is that which is *most distant from* the lacuna and its contents.

"No stellate corpuscle has been produced, but the stellate appearance results from the circumstances that the calcareous matter has been deposited in the matrix in such a manner as to leave intervals arranged in a more or less stellate manner." (p. 132.)

As to the contents of the canaliculi, in *dead dry* bone they contain nothing but air; in *young bone* they are filled with nutrient matter.

"The bony tissue with its canaliculi and germinal matter, always has a certain definite relation to the vessels. It may exist as a simple thin lamina, covered upon each side with a highly vascular membrane, or as solid cylindrical processes often arranged so as to form a network, also invested with a vascular membrane; or the osseous tissue may be arranged in concentric laminæ around a central canal (Haversian canal), which in the living bone is occupied by a capillary vessel, around which are numerous *fine granular cells*. These cells are concerned in the removal of the osseous tissue. * * * * Of a thin plate of bone the tissue in the centre is the oldest. Of a solid cylinder, that in the centre was first formed, while of the laminæ of the Haversian system, those at the circumference are oldest, and the laminæ close to the central vessel were the last developed. The first two forms of bony tissue, constitute the cancellated structure, and the last (Haversian systems) make up the compact tissue of bone; but transitional forms exist." (pp. 133–4.)

The so-called *myeloid cells* are soft masses, having the appearance of large compound cells, composed of the elementary parts ("cells") of bone. At an early period of development, they consist only of several small oval masses of germinal matter, the outer part of which is undergoing conversion into formed material. This increases, becomes impreg-

nated with calcareous matter, forms the little plates or cylindrical spiculæ of bone which enter into the formation of the cancelli. These myeloid cells are found beneath the periosteum as well as in the medullary cavity; and in disease, the soft spongy tissue which is formed in connection with the bone, consists of masses of this kind.

The *periosteum*, usually described as a fibrous membrane, in its outer layers exhibits a simply fibrous structure, but in its deeper portion are seen a number of elementary parts of unossified bony tissue, each consisting of an oval mass of germinal matter surrounded by a granular looking formed material. This deeper layer is the seat of the formation not only of new bone, but of complete Haversian systems.

The *medullary* membrane is a highly vascular membrane resembling periosteum, but more delicate and contains less fibrous tissue.

The medulla, or marrow of bone, is a form of adipose tissue existing in the cancelli, the medullary cavity, and even in the Haversian canals. They probably originate from the proper marrow cells (myeloid cells), which may become converted into bone tissue or marrow, some becoming the former and others the latter.

Development of Bone.—In mammalia, bone begins to form at an early period of intra-uterine life: 1st, by ossification of fibrous membrane; 2d, by ossification of temporary cartilage—most of the bones of vertebrata being represented in the first instance by cartilage.

The writer's view of the processes of *caries* and *necrosis*, processes important in a practical point of view, and yet imperfectly understood in so far as minute changes are involved, must absorb a moment's attention in this already too protracted review. In caries, as in the development of bone, the removal of old Haversian systems and the formation of new ones, in the union of fractured ends of bones and in the formation of bone cancer, "cells," or rather masses of germinal matter, are the active agents.

In *caries*, as in rickets, cancer, and ordinary suppuration, the vital changes going on are too active.

"Increase is proceeding too fast, for the condensation of the tissue to take place. Here, as in all other cases, rapid change is associated with brief duration, while the well-developed normal lasting tissue is formed very slowly, and the changes succeed each other in the most gradual, orderly, and regular manner."

"In caries, the germinal matter of a part of a bone receives too large a supply of nutrient matter, it grows too fast, and lives upon the surrounding tissue which has been already formed." (p. 145.)

In *necrosis*, the death of the germinal matter of many lacunæ takes place. "This results when the supply of blood from any cause is cut off." The passage of blood through the vessels being interfered with, the germinal matter of all that portion of bone receiving nutriment from them must die, and a piece of bone of a considerable size be "necrosed."

Beale explains the formation of the new bone around the sequestrum by supposing that around this the nutrient matter would flow more freely though less regularly; in consequence of which the germinal matter of the neighbouring lacunæ would grow much faster, and finally surround the dead bone. This, in turn, ossifies and the dead bone becomes surrounded by irregularly formed new bone. This Beale believes to take place, not in consequence of any irritation by the presence of dead bone, in consequence of which the cells are *excited* to *increased action*, but simply as the result of a more free access of nutrient matter. He says, "the so-called 'irritant,' instead of 'exciting,' acts in the most passive manner possible, it allows pabulum to have freer access to the living or germi-

nal matter. It removes, to some extent, the restrictions under which growth normally takes place." (p. 147.)

The ninth lecture, which is a long one, is devoted to the *teeth*, the changes in which Dr. Beale thinks receive a most satisfactory explanation upon the new views propounded by him. Here, too, authors have committed the same errors as in regard to bone, by describing the anatomy of dead and dried tooth structure. The dental tissues, of all textures of the body, undergo the least amount of change.

The structures of human teeth are three: 1. Dentine or tooth bone; 2, enamel; 3, cementum or crusta petrosa. The second is the hardest, the first next, and the third the softest; though at an early period all were equally soft, the hardness being due to the deposition of calcareous salts.

The papilla existing, the dentine is formed upon the pulp, but not out of it, and grows constantly in one direction only, from without inwards, and therefore, when the extreme circumference is once formed, it is not possible that the tooth can increase in diameter by dentine, since dentine is never normally formed upon its outer surface. These processes continue, and the tooth gradually increases in depth by the formation of the fang which projects downwards towards the socket which is being formed for its reception. As already intimated, the dentine is not formed from the pulp, but from a *nucleated columnar* epithelium placed at right angles to the surface of the pulp. As new dentine is formed upon the peripheral portions of these cells, the latter encroach upon the pulp, the constituent tissues of which diminish in amount.

The so-called *dentinal tubes* of a *living tooth* are never empty; indeed, they are not tubes, nor are they canals for the transmission of nutrient substances dissolved in fluid, but they contain a soft solid substance, a portion of which near to the pulp is in a state of active vitality, and which is a prolongation from one of the columnar cells referred to. This corresponds with the *germinal matter* of Beale, while the wall of the tube, with the matter between the tubes corresponds to his *formed material.*

"The elongated masses of germinal matter first of all produce *formed material*, which gradually increases as in other cases, upon the outer surfaces of the germinal matter. The formed material of the adjacent elementary parts is continuous, and calcareous matter is first deposited in the oldest part of this formed material. The calcareous matter appears in the form of globules, which gradually increase in size and often coalesce." (p. 156.)

The *enamel rods* are likewise formed from elongated cells which become calcified. These are situated entirely beneath a thin membrane to the under portion of which the most superficial portion or summit of these cells adheres. This membrane is highly vascular, and Dr. Beale has succeeded in making beautiful injections of it in the canine tooth of a pig three months old. The calcareous matter is first deposited in that part of the cell nearest the dentine which was first formed, and is deposited in small columnar masses in successive layers, which are indicated by transverse layers in the fully formed enamel rods. The enamel cell increases in length, and the so-called nucleus moves away in a direction from the dentine as the increase takes place.

The *cementum* is not true osseous tissue. The lacunæ are often larger and more irregularly arranged, the matrix of the cementum is more transparent and harder, and much consists of a very clear transparent structure of a refractive power and hardness much resembling dentine, with small tubes traversing it here and there, but irregularly arranged. Again, the

lacunæ are less numerous than in bone, the canaliculi are often of great length, and cementum is formed much more slowly than bone. Cementum is not formed by ossification of the tooth sac. It is continuous with dentine, and dentinal tubes may often be traced into its structure.

"If the fang of an adult tooth, properly prepared, be examined, a very beautiful soft tissue will be found upon the surface. This takes part in the formation of the cementum, and is concerned in the formation of those exostoses which often grow upon the fangs of the teeth. It is composed entirely of what may be described as branching cells (elementary parts), the processes of which anastomose freely with each other. It is from this tissue that the crusta petrosa (cementum) is formed. It is a most perfect example of a tissue consisting entirely of cells, the cavities of which *communicate with each other by tubes.* The stellate cells are here as distinct as they are in the pith of the rush." (p. 164.)

But they do not, according to Beale, as according to Virchow, constitute an elaborate system of channels for the distribution of nutrient material to the tissue intervening between them. This tissue, growing very slowly, requires little nutrient matter, and the means are far more elaborate than would be expected.

According to Beale's view, these processes are not tubes in the living tooth. During life they contain a solid or semi-solid substance corresponding to that which occupies the so called dentinal tubes. It is *germinal matter* which is undergoing conversion into *formed material,* and the situations in which these so-called tubes existed are the last portions of the formed material to undergo calcification. Many of the stellate masses also disappear during calcification, while the number of processes or tubes projecting from those remaining is increased from ten or twelve to as many as thirty or forty. Hence Beale infers that these tubes are not an early stage of canaliculi, and the cells cannot become lacunæ simply by deposition of calcareous matter in the intervening matrix or intercellular substance. Still calcification takes place, and he also says, many processes become narrower and disappear, as do also many of the stellate masses themselves. This would seem to imply a diminution of the number of processes, which, as already stated, are increased, according to our author. This point is unexplained by him, and can only be accounted for by supposing that although some processes disappear, yet many others remain whose cells have disappeared, and thus the relative proportion of processes to lacunæ is increased. It must be admitted that there is a want of clearness in this section. In summary, Beale says, "the tooth is not developed from a papilla consisting of a sub-basement tissue, but it is formed in the very centre of a collection of cells, and it is clear that these cells have been formed in the central part of a pre-existing mass." According to Beale, enamel and dentine *are an epithelial structure* in the same sense that a hair or the cells in a glandular follicle are regarded as epithelial. This is in opposition to Huxley, according to whom they are *not epidermic* but *dermic.*

With regard to the so-called *membrana præformativa* or *basement membrane,* concerning which there is so much dispute, Beale contends that it is by no means constant, and considers it "*certain* that no præformativa membrane has been actually demonstrated *over* the enamel, as Huxley asserts, *between* the enamel and dentine, as many observers hold, or *beneath* the dentine." But supposing the basement membrane to be a necessary anatomical structure, he admits that the *proper position would be between the epidermis of the skin and the modified connective tissue of which the body*

of a cutaneous papilla is composed. Yet he considers that such a membrane has no more to do with the *formation* of structure beneath it than the capsule of the seed with the formation of the seed itself.

The tenth lecture is on *life*, a part of his subject which our author considers himself incompetent to consider, but feels called upon to make some reference to the nature of life.

In the present course he has attempted to show that

"All discussions with reference to vital actions must be restricted to the consideration of the changes which take place in the particles of germinal matter only, for here the inanimate matter certainly becomes living, and after retaining for a time the active power of animating new matter, the particles most distant from the centre where they become living lose all vital power, and become resolved into various substances, which, there can be no doubt, are again under the influence of physical and chemical laws." (p. 200.)

These changes Beale attributes to the influence of a peculiar power which may be called *vital power*, and feels compelled to accept an hypothesis, inconclusive though it be, until a reasonable explanation of the phenomena is afforded. We are enabled to investigate matter before it becomes living, and through organic chemistry we have learned much of chemical compounds produced when germinal matter becomes formed material, and when formed material is disintegrated. So we know something of the compounds resulting from sudden or slow death of germinal matter; but we *know nothing* of the relations existing between the different elements which constitute a particle of *living germinal matter.*

"Between the time that the inanimate pabulum becomes living and the time that the living matter becomes formed material, there is an interval in which the matter exists in a very peculiar and exceptional state. *This is the living state—a state which is to be distinguished from every other state in which matter is known to exist*—a state not determined or caused by external circumstances, not capable of being communicated to matter through space, nor of being excited in matter by any known agents or combinations of circumstances—a state which may cease to be manifested at any moment, but which, as far as is known, cannot be caused to commence anew. Now, those who have discussed the nature of vital forces have not alluded to this temporary state. They have restricted themselves to the consideration of the matter before it assumed this living state, and after it had passed through it." (pp. 201–2.)

Beale thinks *living matter* of the different beings of creation always exhibits the same general characters, that the granules or spherules forming the germinal matter are made up of spherules ad infinitum—that the intervals between them are occupied by smaller ones separated from each other by fluid containing in solution, 1st, matter about to become living; 2d, substances not capable of being animated; and 3d, in many cases substances resulting from changes ensuing in particles arrived at the end of existence. He believes that all these spherules are free to move, and that the movements always take place in the same direction, *from* the centre at which the particles become living—*centrifugally.* These points of sphericity and centrifugal movement of the ultimate particles of germinal matter are much insisted upon throughout the lectures.

Our author admits that there is no evidence to show how these elements are related to each other, that the changes which occur cannot be explained by physical and chemical laws, and thinks it probable that the ordinary physical and chemical forces are in abeyance:—

"It seems as if there existed at this time a power in obedience to which the

matter became affected in a manner we cannot explain. It is this power which we understand as the life. It is in obedience to this power that the living particles move *from* centres instead of gravitating *towards* centres, like the particles of ordinary matter." (p. 204.)

We fear that from this, as from other speculations upon the same subject, we obtain only inadequate ideas of the true nature of life, and as we are compelled to fall back upon an inscrutable Omnipotence as the source of life, so also we must be content to leave with such Omnipotence alone a knowledge of its true nature.

The remainder of the lecture is devoted to a brief consideration of *vital movements* as simply illustrated in contractility, the movements of the amœba, white blood cells, mucus-corpuscles, &c., as to the cause of which we can only say, *it is* LIFE; *to the chemical constitution of living matters*, of which we are ignorant, because chemical laws in this condition are in abeyance, and it is impossible to analyze matter in the living state; and to the *physical theory of life.* To this latter several pages are devoted. It is very properly denied that the formation of living tissue is the result of physical and chemical changes *alone*, that physical force is vital force. To convince the mind of this it is only necessary carefully to examine the phenomena of a single cell where vital actions are sufficiently distinct. But in these days there is little prospect of this—"the formation and destruction of faunas and floras, asteroids and worlds, suns, and systems, absorb the attention."

Beale objects to the employment, in speaking of lifeless bodies, of terms formerly exclusively applied to changes occurring in living things. Thus "the willow-leaf, like bodies in the photosphere of the sun at a temperature sufficient to convert many metals into vapor, are '*organisms*' which '*develop*' and '*elaborate*' heat and light from the bosom of a new luminous fluid (Sir J. F. W. Herschel, *Good Words*, 1863, p. 282)." So "Dr. Tyndall speaks of a watch as a '*little creature*' which shows 'signs of animation,' and is '*restored to life*' by the application of its key!" Such terms, he admits, are employed metaphorically, but they are open to much misconception.

At the same time, while denying the identity of vital and physical force, Dr. Beale admits that many of the phenomena now generally considered to make up the life of a fully formed organism, are physical phenomena, but contends "how very much there remains nevertheless to be explained!" The error of the physicist lies in this that he does not inquire how the matters decomposed were *produced*. Dr. Beale has been accused of materialistic views. We must confess there appears, in our conception, nothing in the little volume before us which can justify such accusation.

As has already been intimated, we fear that this review has been too prolonged. We have abstained from criticism, have quoted rather than commented, in consistency with our object early stated, to give to the American profession an opportunity of becoming familiar with the views of Professor Beale, of making such practical applications of them as possible, and of confirming or refuting them as may appear most consistent with the dictates of their own reason. J. T.

BIBLIOGRAPHICAL NOTICES.

ART. XV.—*Transactions of American State Medical Societies:—*

1. *Transactions of the Twenty-First Annual Meeting of the Ohio State Medical Society, held at Ohio White Sulphur Springs, July* 19, 20, *and* 21, 1866. 8vo. pp. 173.
2. *Transactions of the Medical Society of the State of Pennsylvania, at its Seventeenth Annual Session, held at Wilkesbarre, June,* 1866. Fourth Series—Part II. 8vo. pp. 152.

1. THE *Transactions of the Ohio State Society* opens with an address by B. S. BROWN, M. D., the retiring President, which contains many very sensible remarks, though nothing of a very novel character. A brief sketch is given of the onward march of our profession in the road of discovery and improvement—its duties to itself and the community at large—and the imperfections, many of which are perhaps irremediable, which still cling to it. Some of the opinions of Dr. B. are very loosely expressed, and there are some, the correctness of which may be called in question.

A very good report on "*Military Surgery*" is presented by Dr. NORMAN GAY. It treats of the different plans of amputation and of *resections*, their applicability and favourable results.

The report on Obstetrics, by THADDEUS A. REAMY, M. D., of Zanesville, presents a concise history of the advance of obstetrics from a mere trade to the dignity and exactness of a science. Some very good remarks are offered on the management of abortion—destitute, however, of any decided originality. Criminal abortion occupies a large portion of the report. The reporter, in considering the subject, is particularly outspoken. The practice is unquestionably on the increase in every portion of our country, especially in the large cities; not only in the unmarried female to conceal the shame of an "illegitimate bird," but in the married also, who are willing to consent to the murder of their unborn offspring to escape the trouble, expense, and responsibility of rearing them after their birth. It is in vain to attempt to put a stop to the practice of abortion until the public shall be duly convinced of the demoralizing effects of its practice by married females as a matter of mere convenience.

A very severe, and not altogether undeserved, criticism of Dr. Hildreth's paper on rupturing the membranes, artificially dilating the os, with the use of ergot and chloroform, as a means of shortening tedious labour is presented. There are cases and periods of labour in which rupture of the membranes will shorten labour; but their too early or inopportune rupture, especially when followed by the forcible dilatation of the os uteri, and the administration of ergot, is liable to produce serious injury to child and mother, as is pointed out in the report.

The reporter approves of the application of instruments to shorten labour in certain cases, when there is neither a contracted pelvis nor other impediment to delivery. The practice is liable, however, to lead to a serious abuse of instruments which would render us loth to recommend it. Speaking of the use of chloroform in midwifery, the reporter remarks, that in severe obstetric manipulations and operations he would prefer giving the anæsthetic by inhalation; but under all the other circumstances in which its administration may be desirable, he advises it to be given by the mouth. When mixed with milk he has seldom known it to produce nausea or vomiting.

In cases of prolapse of the funis the plan of placing the woman on her elbows and knees, so as to make an inclined plane on the anterior surface of the uterus, is commended. The reporter employed it in six cases of prolapsed cord. In four of which he succeeded without difficulty in returning the cord, and thus

saving the children. In the other two the head was low down, and the cord already much compressed. All efforts at replacement were ineffectual, and both children were lost.

The reports are followed by an interesting paper on the "*Therapeutics of Zymotic Diseases*," by Dr. E. B. STEVENS, of Cincinnati. On the subject of the remedial efficacy of the saline sulphates in the diseases usually ranked under the head of zymotic, Dr. S. remarks: At present we simply summon the large array of respectable and credible witnesses to prove results; and certainly until now the weight of testimony inclines in favour of the value of this class of remedies in that extended group of diseases. Whether the explanation of their beneficial results will bear a strict analytical examination remains to be proved.

In our own opinion, the great mistake in the doctrine which suggests the prescription of sulphites in the zymoses is, *first*, in the supposition that they are uniformly applicable to all cases of blood poisoning; and, *second*, that they arrest a *process of fermentation*, in the same way they do in ferments exterior to the body. In cases where they exert a curative effect we doubt not it will prove to be just in the same way that quinia and arsenic do in ague; that is, by supplying necessary principles to the blood, and aiding the process of elimination; and they in addition exert a third influence in reference to the morbid poison producing the disease, as is exhibited in the antagonism of certain poisons—opium and belladonna, alcohol and the virus of the snake.

Dr. W. C. HALL, of Fayetteville, Ohio, relates a case in which a wire hair-pin had been introduced by a female into her urethra for the purpose of thus relieving an intolerable pruritus vulva, and which had escaped thence into the bladder, where it had remained nine months, giving rise to troublesome symptoms. It was finally removed with some effort by means of an extemporized hook and the fingers of the operator. The pin, in its bent form, was four inches long; it was no ways altered, except being covered for more than half its length by calcareous matter, and in its other portion somewhat eaten away by rust. It seemed to have become imbedded in, or at least adherent to, the wall of the bladder. Very little blood escaped during or after the operation. An anodyne was given, and the patient passed a pretty comfortable night. For some days there was incontinence of urine. She soon, however, began to improve, and in one month was up, and in two she was able to visit her friends.

A report on the "*Influence of Public School Instruction on Health*" was made by R. M. DENIG, M. D., of Columbus. The reporter confines himself to an investigation of the influence upon health, of the system pursued in numerous schools, public and private, of requiring daily of the pupils many hours of continued mental application in the study and recitation of various branches of learning totally unconnected with each other, and this with no, or a very short, allowance of time for exercise and recreation.

I consider it entirely unnecessary (we quote the sentiments, if not the precise words, of that portion of the report furnished by Dr. J. C. Reeve), to adduce to a body of practical physicians illustrations of the fact that an overstrain of the mental powers in youth weakens them and produces disease. As physiologists, we know that no growing organ can bear excessive labour, and the brain least of all. As pathologists, we know that to this cause is traceable, with frightful frequency, the broken-down mental constitutions of middle age, the act of suicide, and many of the sad wrecks found in our lunatic asylums. The public mind needs instruction on this subject, and in fulfilling our avocations as physicians, having ever in view the fact that the highest aim of our calling is to prevent disease, we must supply this instruction. Especially should we urge the important fact that much injury may be inflicted in youth, the effects of which will not be felt until a later period of life. The bad seed sown in the school-house may only bear fruit in after years. It may be long in ripening, but ripen it most certainly will.

The concluding report is "*On the Number and Condition of the Incurable Insane*" in the different counties of the State of Ohio. The number of these unfortunates throughout the State are reported as about 240, the treatment of a majority of whom is anything other than what we would believe would be tolerated in the midst of a professedly enlightened, religious, and humane com-

munity. It is surprising to us that the condition of the irrecoverably insane has not been earlier pointed out, and, by their legitimate advocates, the physicians of Ohio, measures taken to place them in appropriate asylums, where their physical wants may be properly attended to.

2. *The Transactions of the Seventeenth Annual Session of the Medical Society of the State of Pennsylvania* comprise but few county reports, most of which are particularly barren of interest, presenting only loosely stated general facts in reference to the leading diseases which prevailed during the twelve months preceding the session in the different counties or sections of the State. Even the facts embraced in the reports are but little adapted to enlarge our acquaintance with the etiology of the prevalent diseases in different seasons and localities, from a neglect on the part of the reporters to compare them with the medical topography of the places where, or the meteorological phenomena which preceded or attended their appearance. The report from Alleghany, it is true, is preceded by a very full and satisfactory outline of the topography, geology, hydrography, meteorology, etc., of the State, illustrated by a very good map. A slight sketch of a similar character precedes, also, the report from Lycoming County.

From a careful perusal of all the reports contained in the volume before us, we should infer that the general characteristic of the past year, throughout nearly the entire State, was heavy rains, succeeded, late in the summer, by a drought of some continuance, a very variable temperature of the atmosphere, the average being decidedly mild.

The session was opened by an address from the president, Dr. William Anderson, the leading theme of which was the mission of the physician and the essential requisites for its successful fulfilment.

In the report from Alleghany County, we are informed that a rain which continued with a constancy unusual to that climate, commenced on the 10th of June, 1865, and continued, with intermissions of only a day or two, until the 11th of the ensuing August, without any marked reduction of temperature. Speaking especially of the city of Pittsburg, the report states that during this long wet spell, the atmosphere became so surcharged with moisture that articles deposited in closets, etc., soon became thickly covered with a blue mould, and instruments rusted in their cases. Much personal discomfort arose from the arrest of the natural cutaneous transpiration, the body being constantly bathed with a profuse moisture. Most persons complained of an engorgement of the air-passages; some experiencing severe dyspnœa, others a profuse catarrh. Nettle rash of a persistent and severe form prevailed among both old and young; it did not appear to be influenced by diet, nor any of its ordinary causes.

Whilst in the city of Pittsburg the streets and alleys were almost daily drenched with rain, the number of sick was greatly reduced, and the mortality diminished in a corresponding degree. Several cases of intermittent fever, a disease seldom met with in the vicinity of Pittsburg, were encountered during this wet season; they were of the quotidian type.

During the year 1865 very few deaths occurred from scarlet fever, smallpox, measles, or hooping-cough. Only twenty-six deaths from all the four diseases were reported in the city of Pittsburg.

During the early months of the year, and in summer, a few cases of typhoid fever, of a rather unusually fatal character, were met with, and on the 20th of November a large number were suddenly attacked with the disease. It was almost entirely confined to the city. Though many of the cases were severe, the attacks were in general, though distinct in character, of an extreme mildness. The deaths reported for the whole year were only sixty, while it was estimated that during the last quarter of the year there occurred no less than twelve hundred cases of the disease. The comparatively filthy nature of a locality was, we are told, a pretty sure and constant index of the severity of the fever.

In the commencement of the attack there was, in all cases, a well-marked remittent type, with a decided remission, which almost always occurred about four o'clock P. M. After the third or fourth day, however, the intermittent character entirely disappeared, and the symptoms which are considered as

pathognomonic of typhoid fever uniformly occurred. The *tache rouge* could always be discovered about the seventh day. There was seldom any complication of disease of chest or bowels. In a few cases convalescence took place on the tenth day, but more generally not until the eighteenth; several, however, continued for five or six weeks, recovering with great difficulty, without any decided period of convalescence. The recovery was nearly always satisfactory; there were few instances of relapse. Slight attacks, particularly when attended with inactivity of bowels, were in several cases succeeded, after some weeks, by a troublesome diarrhœa, which came on suddenly.

When typhoid fever appeared in Pittsburg, the city was deluged "with reeking, noisome filth." The reporter believes that the damp nights of autumn, with the hot sun shining during the day upon this accumulation of compost, had much to do in developing the disease. Dr. T. J. Gallagher refers its direct cause to the water in daily use. It is obtained from the Alleghany River, through a supply pipe laid in the body of the stream at a point where much refuse and offal from the upper part of the city are encountered.

Dr. Semple reports that during sixteen years' practice in Wilkinsburg, Alleghany County, and its immediate vicinity, he had never met with a single case of intermittent fever originating in that locality until September, 1865, between which period and the end of November he treated seventeen cases, three occurring in Wilkinsburg and fourteen on the banks of the Alleghany, three miles distant. Eleven cases were of the quotidian type, and six of the tertian. All yielded readily to full doses of quinia. There were no noticeable sequelæ.

In the report from Berks County, typhoid fever is noticed as having prevailed in 1865 to some considerable extent, in a district some ten miles northeast of Reading; here, during the fall and winter months, some forty cases occurred. The pathognomonic symptoms of the fever were well marked. The bowels were the organs chiefly implicated—there were no cases attended with thoracic disease. Some facts are adduced to prove the contagious character of the fever; they are far, however, from being conclusive. No especial exciting or predisposing cause of the endemic was noticeable. The soil is gravel, bordering on limestone. The inhabitants are farmers and mechanics, and in the main frugal, industrious, and temperate.

In the report from Bradford County it is remarked that the character of the fevers which occur has within the last few years undergone a material change. Formerly they were purely typhoid, but now they are typho-malarial. But few terminate fatally.

Dr. Cole states that, as early as May, he met with a low form of bilious-remittent fever, and that since scarcely a day passes without the occurrence of new cases of the disease. Dr. C. treated sixty-five cases of the disease during the year. It attacks persons of all ages, and of both sexes, and pays no regard to season or location. In about half the cases the fever ran its course in about twenty-one days, the other half in from ten to nineteen days. In many instances it ran through entire families.

The symptoms were yellow or jaundiced appearance of skin and eyes, headache, pain of back and limbs, lassitude, loss of appetite, tongue thickly coated, sickness of stomach, in many cases vomiting and diarrhœa. Upon the subsidence of the fever, symptoms of great exhaustion are apt to ensue; the tongue becoming covered with a dark hair-like fungus; in one instance it appeared to be half an inch in length, and remained some time after convalescence had set in.

Malarial diseases, either remittent or intermittent, prevailed during the entire winter in different parts of Bradford County, and of unusual severity. They usually begin with chills, a sense of weakness, with trembling, slight pains of head, neck, back, and lower limbs, loss of appetite, occasionally nausea. This forming stage may continue from three to seven days, with little or no fever. When fever sets in, in the great majority of cases it is marked by intermissions or well-marked remissions and exacerbations; the type being quotidian or double tertian, rarely quartan. When neglected or improperly treated the fever soon assumes the continued form, with hot, dry skin, *calor mordax*, brown or black tongue, more or less coma, and at night considerable delirium. If not relieved,

the symptoms increase in severity, and death may take place in from three to five weeks from the commencement of the attack. Constipation is more frequently present than diarrhœa. Cough, with much expectoration, was generally present, as was also congestion of brain and lungs. Gastritis or gastro-enteritis, either with or without disease of the muco-glandular structure of the bowels, was seldom if ever present. The most effectual treatment, we are told, was that usually pursued in periodical fevers. There was an unusually luxuriant vegetation during the summer of 1865, with frequent, copious rains, and this, it is suggested, was probably the chief cause of the severity of the fevers observed.

In the same report Dr. Mason remarks: "Fever, of miasmatic origin, has been with us constantly. During the year '65, fifty per cent. of all the sickness has been fever. It assumed a variety of types. Many cases presented the usual symptoms of "simple bilious fever," while in other cases it was difficult to distinguish it from true enteric fever; again, there was, sometimes, an apparent blending of the symptoms of both bilious and typhoid fever, while again the case would present all the features of a case of pure typhoid, and run a course of from fifteen to twenty days, and then change its type to that of a tertian or quotidian ague, and this in the depth of winter. These fevers have been named by some typho-malarial. Some of them appear to be neither, being, apparently, cases of simple continued fever, without any disease of the muco-glandular bodies of the intestines. The cases were mostly mild, but generally lasted from eight to thirty-six days. The simplest treatment, we are told, succeeded the best in the treatment of these fevers."

Typhoid fever prevailed also in portions of Bucks County.

In the report from Indiana County, it is stated that of late years the fevers of that section have been mainly of the typhoid or intermittent form. To places along the larger watercourses intermittent fever is endemic. The malarial cause is often to be recognized, also, in the continued form of fever. In some localities it is a rare thing to meet with a clear case of intermittent or of typho-malarial fever. But in the southern portion of the county pure malarial disease is not unfrequent. What has been termed by some of our physicians *typho-malarial fever* is new, we are told, in Indiana County. The writer of the report from the county remarks that he presumes it would be called by many remittent; but upon a close and careful analysis some very striking differences are to be noticed. At the onset of the disease the symptoms very much resemble those of typhus, of a somewhat mild form. They are headache, chilliness, loss of appetite, white coating of tongue, bronchial cough, scanty and high coloured urine, laxity of bowels. When the chill and sweating stage are passed, the skin becomes hot and dry, the headache increases, together with all the other symptoms. Having reached their maximum, a remission sets in, usually once in twenty-four hours, after which the same train of symptoms are repeated. Epistaxis occurs about the end of the second week from the full establishment of the disease. The pulse is usually full, but not frequent, seldom exceeding ninety per minute, compressible, never bounding; varying little until the disease begins to abate, when it becomes slower, softer, and fuller. The steadiness of the pulse is remarkable even when the cerebral symptoms are the most distressing. No eruption has been detected upon the skin. Thirst is not excessive; no vomiting; little intestinal difficulty; bowels open about every twelve hours. When the crisis has been reached, great muscular prostration ensues, with low muttering delirium, which lasts from five to eight days, with picking of the bed-clothes, and all the signs of exhaustion met with generally in the continued form of fever.

In the report from Lycoming County, Dr. Crawford records no prevalence of epidemic disease, but a more general prevalence of the endemic diseases of the valley; all of them partaking more or less of a malarial type. All the cases of fever that came under his notice were of the so-called "typho-malarial" character, and when not broken up in the first stage by antiperiodics, ran a protracted course, but generally terminated favourably.

In the report from Perry County it is stated that there was, apparently, a greater tendency to intermittent fever than usual, and an unusual tendency also

in many diseases to assume a periodical form. Along the watercourses, as usual, remittents and intermittents prevailed, but to no very great extent.

The tendency in other diseases to assume an intermittent type was more manifest at points remote from the rivers than in their immediate vicinity. In some instances the intermittent feature was very persistent, requiring more than usual care on the part of the patient to prevent the occurrence of relapses.

Typhoid fever and diseases of a typhoid type were rarely met with, and when they did occur were mild in character.

In the report from Schuylkill County, Dr. G. W. Brown remarks that, on the approach of autumn, bilious intermitting and remitting fevers became very prevalent, much more so than for the previous twenty years. Some of the cases were highly inflammatory, others assumed a typhoid form, while others, again, were attended by severe neuralgic symptoms. The population is largely made up of boatmen, many of whom, with their families, live during the summer, in their boats, travelling between the county and New York. Among this portion of the population, towards fall, cases of intermittent fever are annually met with. In the autumn of 1865, however, the disease was very prevalent among the permanent residents. At the commencement and close of the year typhoid fever occurred to some extent. Fatal cases, which were few in number, were usually attended with profuse hemorrhage from the bowels. Dr. Carpenter, of Pottsville, notes the prevalence of typhoid fever, thirteen cases of which fell under his care. Four of these were *typho-malarial*, and originated from drinking the water of a well so replete with decaying vegetable matter as to be unpleasant to the sense of smell. Several of the cases occurred in soldiers who had been imprisoned in the pens at Andersonville and Florence.

Two cases of congestive fever were met with. In one death took place notwithstanding quinia, in large doses, was given at the second paroxysm. This occurred in a patient prostrated by chronic diarrhœa contracted in the army.

In the report from Susquehanna County, it is stated that some cases of typhoid, remittent, and intermittent fevers occurred, but presenting in their character and course nothing especially worthy of note.

In the report from Westmoreland County, Dr. McConaughy, of Madison, states that typhoid fever did not prevail epidemically in 1865. He had about twenty sporadic cases to attend, one of which was in a returned soldier. He was recovering from the disease when discharged. Upon exposure to cold and wet, he had a relapse, of which in a few days he died with symptoms of perforation of the bowels.

According to Dr. Stevenson, of Adamsburg, typhoid fever prevailed during the first three and last four months of 1865.

Of *spotted fever*, or cerebro-spinal meningitis, mention is made in only five of the reports—those from Lehigh, Northampton, Schuylkill, Susquehanna, and Westmoreland. In none of the sections referred to does it appear to have prevailed to any great extent.

Of *scarlet fever* the same remark may be made. It is noticed in the reports from Bucks, Lycoming, Northampton, and Schuylkill.

Measles is noticed as "having prevailed," in the reports from Bucks and Lycoming.

Erysipelas seems to have been met with quite frequently in Berks, Bucks, Lycoming, and Schuylkill. In the first mentioned county it was mostly traumatic; in the last both traumatic and idiopathic.

Smallpox occurred to a slight extent and in a very mild form in the counties of Alleghany, Bradford, Perry, and Schuylkill.

We have culled from the several reports comprised in the Transactions before us whatever facts they contain in relation to the fevers prevalent in the different sections of the State of Pennsylvania from which those reports emanate; and have presented them in one continuous view. If the facts referred to have no further value, they at least give a very interesting though, it is true, a somewhat imperfect exhibit of the forms and character of the fevers recently prevailing in different portions of our State.

In addition to the fevers and the usual sporadic, more properly, perhaps, climatic, diseases, the reports in the volume before us refer to the occurrence in

several of the counties of *diarrhœa*. In Bradford it is said to have been of a very severe form; of *dysentery*, constituting in some localities a somewhat formidable endemic; of *diphtheria*, which, however, prevailed, it appears, to no great extent in any of the sections of country heard from; of *jaundice*, which, in Bradford, is said to have been particularly frequent and severe. An extraordinary prevalence of *neuralgia* is noticed in the report from Bradford, while the prevalence of *pertussis*, never, however, to any great extent, is referred to in the reports from Bradford, Indiana, Lehigh, Lycoming, and Schuylkill.

There has prevailed, apparently to a very great extent, throughout our State, a peculiar cutaneous eruption popularly termed the "army or soldier's itch," to determine the true character and nature of which has greatly puzzled physicians. The following remarks on this affection, contained in the report from Northampton County, accord with the views we have formed of its nature, based on the study of the cases which have fallen under our own notice. "The cases reported under the name of 'army itch,' it is evident, cannot be referred to *scabies*, as they have not yielded to the treatment pursued so successfully in that disease. It is, also, evident that different diseases have been classed under the same name, for the treatment has varied too much, and the same remedies have too often failed in different hands, for us to believe that the different practitioners have had the same disease under treatment. Besides the cases which have occurred with us have seldom spread from the sick to the well. It has frequently occurred that an individual affected with a troublesome disease of the skin, attended with a most intolerable itching, has slept with another without the latter contracting the disease; such cases have invariably resisted the treatment by sulphur. Some of these are cases of *eczema*, others of *prurigo*. It may be questioned whether the cases which yield readily to the sulphur treatment, internally or externally, or to the solution of sulphur and lime, are not true cases of scabies. We are not aware that any of these cutaneous affections were more prevalent among soldiers than among those who had never been in the army. It is very well known that the same diseases were quite as common before the war as since its close. We cannot avoid the conclusion that the term 'army itch' is a misnomer, and that we shall not arrive at a course of treatment that can be relied upon in the several species of cutaneous disease that have been confounded under that name, until they shall be more clearly distinguished."

A report made to the Alleghany County Medical Society, by Dr. A. I. Davis, of East Liberty, gives an account of "an abnormal pregnancy of *forty-nine* years' duration." The subject of this abnormal pregnancy had been married four years, when, being in her thirty-second year, she became pregnant for the first time. Her period of gestation was marked by nothing unusual. At the proper period, labour appeared to come on, but after the occurrence of a few pains, it ceased entirely. The prominence of the abdomen remained, as if caused by a tumour in one of the iliac regions, and so continued up to the period of her death, forty-nine years subsequently. It produced scarcely any inconvenience save that in micturition the urine was passed slowly, and with occasional interruptions in its flow. The lady died November 1, 1851, in the eighty-first year of her age. At her request, a post-mortem examination of her body was made. There was found in the abdomen a fœtus encased in a closely-fitting osseous-like envelope, having the appearance of a hard ovoid tumour, six inches long and fifteen at its greatest circumference; the walls being about one-third of an inch in thickness. The fœtus itself was a female, fully developed in all its parts, with a full crop of hair. When handled it had an indurated or leather-like feel. Its appearance was not unlike that of a fœtus that had been long preserved in alcohol.

D. F. C.

ART. XVI.—*Reports of American Hospitals for the Insane:—*

1. *Of the State Asylum, New York, for the year* 1865.
2. *Of the King's Co. (N. Y.) Asylum, for the fiscal year* 1865–66.
3. *Of the Retreat, at Hartford, Conn., for the fiscal year* 1865–66.
4. *Of the Butler Hospital, for the year* 1865.
5. *Of the State Asylum, New Hampshire, for the fiscal year* 1865–66.

1. THE *State Lunatic Asylum*, at Utica, N. Y., as is shown by the report for 1865, has "become overcrowded. * * * The highest number of patients at any time during the year was 616; the lowest 557; and the daily average 591. This gives a household of about seven hundred people."

	Men.	Women.	Total.
Patients at the beginning of the year, . .	283	281	564
Admitted in course of the year, . . .	184	172	356
Whole number, ...	467	453	920
Discharged, including deaths, . . .	158	147	305
Remaining at the end of the year, . .	309	306	615
Of the discharged, there were cured, . .	60	53	113
Died, ...	27	30	57

Deaths from phthisis pulmonalis, 23; general paresis (*paralysie générale*), 14; exhaustion from mental disease, 4; apoplexy, 3; paralysis, 4; meningitis and cerebritis, 2; epilepsy, 5; old age and exhaustion, 1; perforating ulcer of the stomach, 1.

"Twelve men and two women died of general paresis. Whether this fatal disease is more prominent than formerly, or whether the increased number sent to the Asylum each year, results from the fact that professional men recognize the disease more generally and send them to our care, I will not here discuss. My conviction is that it is on the increase. In twenty-two cases of paresis received during the past year, not a single case had been previously recognized by the attending physician, and for that reason committed to our charge. In fact, few medical books speak of the disease, and cases of it are not reported in ordinary standard medical works.

"Few women, according to our observation, suffer from this disease. The two who died of paresis, the present year, were well-marked cases, exhibiting all the ordinary physical and mental symptoms."

The whole number of cases of this peculiar and interesting, though exceedingly fatal form of mental disorder, which have been admitted since the beginning of the year 1849, is, men 102, women 8; total 110. Of these, 80 men and 7 women have died. Nothing is said of cures, or of the whereabouts of the remaining fourteen. The report contains a brief history, with the post-mortem pathological conditions, of several cases.

Dr. Gray's report is replete with interesting matter, a large part of which is statistical, and consequently the result of much labour. His exposition of the medical treatment pursued at the hospital is, in our opinion, the most valuable portion to the general medical reader, and we therefore extract it nearly in full, although its length transcends our usual limits.

"In cases of acute mania as a means of calming excitement and inducing sleep we use tinct. hyoscyamus, and tinct. ext. cannabis Indica, either singly or combined, in doses of 1 or 2 drachms, twice or three times daily. In some cases one or two drachms nightly, secures the desired effect. When there is full habit and strong pulse, the most satisfactory results are sometimes obtained by combining with one of these tinct. digitalis. When there is much nervous agitation and restlessness from an enfeebled condition of the nervous system, we have found great benefit from the use of tinct. valer. comp. and ammoniated fluid extract of valerian, both in soothing and calming the agitation and in inducing sleep. If there is marked cerebral anæmia, we resort to stimulants, such as brandy punch, egg nogg, whiskey punch, wine and morphia, in combination with tinct. hyos. or cannabis Ind. When morphia is not tolerated, we endeavour to secure the stimulating effect of opium by the use of Squibb's aqueous solu-

tion, which is often well borne when other preparations are not. In all feeble cases we endeavour to secure the horizontal posture, at least several hours in twenty-four, and in cases of marked prostration much more, in order to secure a full circulation of the blood to the head and spinal column, and thus nourish the great nervous centres. In many cases of acute mania with great exhaustion, horizontal posture for days and weeks has, we are well persuaded, been the means of saving the patient's life, when medication and nutrition alone would have failed, and in other cases it has prevented the patient from sinking into dementia. In enfeebled states, in all diseases, the vital importance of maintaining a horizontal posture is recognized, and in cerebral anæmia, a condition so often present in insanity it is the vital indication. * * *

"In melancholia, constipation is commonly present, not as a cause, but dependent generally on torpor of the bowels, peristaltic action, in some cases seeming almost suspended—a condition probably arising from defective reflex action and blunted sensibility of the peripheric sentient nerves. * *

"If habits of regularity can be enforced, and the attention of the patient directed from his condition, much has been attained. * * *

"In the decoction of rhamnus frangula, however, we have found the most available remedy, alone or combined with small doses of podophyllum. The rhamnus has also this quality. Its effect is not decreased by long continuance; but, on the contrary, it may be gradually diminished in doses, and may be given for a long time without losing its effect, and with permanent relief. It is also a good stomachic, and in these respects differs from ordinary cathartics. We have also found much benefit from the employment of the pill Ext. col. co. gr. iii; Pulv. ipecac. gr. i. In melancholia we use morphia in solution, alone or combined, with hyoscyamus, and on the anæmic and enfeebled we believe its primary stimulating effect on the brain highly beneficial. In such cases we give it in doses of one-quarter to one-half grain three or four times daily, and often combined with whiskey, wine, brandy, or ale. With these we give raw eggs, or eggs and milk, and other highly nutritious animal food, and with the most satisfactory results. Some very unpromising cases of melancholia admitted during the past year have recovered rapidly under this treatment. We have given as much as one and a quarter grs. of morphia, and from four to ten eggs daily, in critical acute cases, in addition to other nutrition, with marked advantage. We have also used in special cases, when indicated, tinct. lupuli and tinct. conii, with more or less benefit.

"In the excited and sleepless stage of general paresis we have obtained favourable results from tinct. cannabis Ind., either alone or with tinct. digitalis, and in some cases from bromide of potassium.

"This latter remedy we have used largely in epilepsy for the past three years especially, but we have not found as much benefit to result from it as we had been led to hope for from the accounts in some foreign journals of its value in this disease. * * * * *

"We have administered the bromide in cases of high nervous irritability, with subacute maniacal excitement, and in cases of restive, agitated melancholia, with the most satisfactory results.

"As an anaphrodisiac it is a highly valuable medical remedy. We can recommend it as one of the most effective to control the phrodisiac state so often unhappily associated with insanity. * * * *

"As tonics we use the ordinary tinctures of cinchona, gentian and columbo, and often combined with some preparations of iron, though we depend on ale more largely in conditions of general enfeeblement, and on the above as adjuvants. We also use cod-liver oil with ale or wine in many of these cases. We have reason to believe that several preparations of iron act beneficially on the nervous system, both directly as stimulants, and at the same time furnish material for the blood, as maintained by some authorities.

"In concluding this portion of my report, I would add that nervines and such remedies as act on the spinal cord, and on the nerves of the vascular system, as well as the various alteratives and stimulants, are administered in all stages of insanity, as indications may arise. About one-fourth of all admissions are so far prostrated as to require, in addition to medication, for a longer or shorter

period, extra diet, such as concentrated soup, essence of beef, eggs, oysters, milk, or beef extract."

2. The numerical results of the operations of the *King's County Lunatic Asylum* (N. Y.), for the fiscal year ending with the 31st of July, 1866, are as follows:—

	Men.	Women.	Total
Patients at the beginning of the year, . .	186	246	432
Admitted in course of the year, . . .	111	132	243
Whole number, ...	297	378	675
Discharged, including deaths, . . .	99	106	205
Remaining at the end of the year, . .	198	272	470
Of the discharged there were cured, . .	40	49	89
Died, ...	32	33	65

Died of phthisis, 17; exhaustion, 10; paralysis, 10; general paralysis, 8; apoplexy, 3; congestion of the brain, 4; meningitis, 4; softening of the brain, 2; diarrhœa, 2; epilepsy, atrophy of the brain, carcinoma, typhoid fever, and suicide, 1 each.

"The Asylum has been free from contagious, epidemic or zymotic diseases during the year, with the single exception of a case of typhus fever, which was contracted before admission."

The hospital is crowded with patients, and Dr. Chapin recommends its enlargement by the addition of a section to each of the two wings.

3. "During the past year," remarks Dr. Butler, in his report for the official year 1865–66, of the *Retreat for the Insane*, "the wards of the institution have continued to be overcrowded." The number of patients has exceeded that of any preceding year.

	Men.	Women.	Total.
Patients in hospital, April 1st, 1865, . .	119	119	238
Admitted in course of the year, . . .	69	96	165
Whole number, ...	188	215	403
Discharged, including deaths, . . .	63	95	158
Remaining, March 31st, 1866, . . .	125	120	245
Of the discharged, there were cured, . .	20	42	62

"Of the deaths, 12 were of males, and 14 females. Of these, 7 were from exhaustion of acute mania, 6 from simple exhaustion, 3 from chronic diarrhœa, 2 from dysentery, 2 from disease of the lungs, and one each from apoplexy, diarrhœa, asphyxia, abscess, pneumonia, and paralysis."

The Doctor congratulates the Board of Directors "upon the great improvements which have been made about the Institution during the past year. Since the grounds were laid out and ornamented according to the admirable and successful plans of Messrs. Olmstead and Vaux, in 1860, nothing has added so much to the beauty of the surroundings of the Retreat. The old close and unsightly fences about the buildings have all been removed, and now, ornamental, and, in some places, light, open fences have been erected in their stead."

This report is unusually brief, in consequence, as therein intimated, of the ill-health of Dr. Butler—a fact which his many friends will regret. For this reason he excuses himself from a further consideration of the treatment of the chronic insane, a subject discussed in his preceding report. He estimates the number of insane persons in Connecticut to be seven hundred, while "the reasonable capacity of the Retreat, the only Lunatic Hospital in the State, is two hundred and ten."

This deficiency of hospital accommodations is about to be remedied. A legislative Board of Commissioners have recently selected a site for a State Hospital.

4. The number of patients and the results for the year 1865, at the *Butler Hospital for the Insane*, are as follows:—

	Men.	Women.	Total.
Patients at the beginning of the year,	67	65	132
Admitted in course of the year,	25	17	42
Whole number,	92	82	174
Discharged, including deaths,	22	21	43
Remaining at the end of the year,	70	61	131
Of the discharged, there were cured,			11
Died,			16

Nearly the whole of this report consists of an essay upon the now much agitated subjects—the treatment of the incurable insane, and the value of their labour as an element in the means of support. The argument is detailed and exhaustive, with the exception of a single point, which, as appears to us, is of very great importance. The Doctor overlooks the fact, mentioned by Dr. Gundry, and some others, that, if the incurable be separated from the curable, the two classes being provided for in different institutions, the amount of remunerated labour at the hospitals for curables will necessarily be much increased.

Inasmuch as all the general heads of this essay have been mentioned in our notices of the reports of other institutions, and in consequence of the difficulty of making any satisfactory *abstract*, which should not include *the whole*, we must refer such of our readers as desire to see it, to the report itself, merely copying one passage for its historical value.

"In the early stage of this benevolent enterprise of establishing hospitals for the insane, one of the principal objects proposed by it was the proper care and custody of the old incurable cases. It was their sufferings as exhibited in the jails and poor-houses of the country, which, some five and thirty years ago, led Horace Mann and a few others to begin that movement, the first fruits of which were the hospital at Worcester. They laboured, as they supposed, for the poor, the neglected, the friendless, the hopeless, not for the wealthy and curable, who might be safely left to the ministry of their friends. For a time it seemed as if the precise object of their labours had been accomplished and placed beyond the reach of any change of fortune. The jails and poor-houses were emptied of these unfortunates, and an incalculable amount of relief from the last extremity of human wretchedness was effected. A more curious change of purpose has seldom been witnessed than that which has been induced on this subject by the very development of the original enterprise itself. For whereas the object at first was to place all these persons in the hospitals, the question that agitates the philanthropists of our day is, how best to get them out of the hospital."

5. The late Moody Kent, Esq., a lawyer of Concord, N. H., has made the New Hampshire *State Asylum* his residuary legatee, and the amount thus coming to the institution will amount to the handsome sum of one hundred and forty thousand dollars.

	Men.	Women.	Total.
Patients in hospital, May 1, 1865	103	120	223
Admitted in course of the year	55	49	104
Whole number	158	169	327
Discharged, including deaths	50	41	91
Remaining, May 1, 1866	111*	125*	236
Of those discharged there were cured	12	14	16
Died	13	8	21

* The numbers here should be 108 and 128 to be consistent with the foregoing figures. We have followed the *text* of the report, and Dr. Bancroft is one of several of the Superintendents who, because they do not believe that "figures can't lie," or for some other reason, put all their principal statistics into Roman text, instead of Arabic numerals. We take this occasion to remark—what we have many times before thought of saying—that, in our reviews of reports, we have found probably twice as many errors, proportionally, in those which give the statistics in words, as we have in those which give them in numerals: so that we long ago came to the conclusion that if "*figures* can't lie," Roman text can.

Causes of death.—Exhaustion of acute mania, 3; "gradual wasting of the powers of life from chronic mania, 5; organic disease of the brain terminating in effusion, 2; tubercular consumption, 3; diarrhœa, 2; apoplexy, 2; paresis, 1; "slow decline of life," 2; intestinal obstruction, 1.

"Each successive year shows a larger amount of labour done, in various ways, and a larger variety of entertainment and amusement afforded, with increasing evidence of their value."

Dr. Bancroft shows that the hospital is crowded with patients, and recommends an enlargement of the building. It appears from his report that the Trustees have decided not to expend any of the principal of the above mentioned legacy, but to preserve it "forever entire," and to appropriate the interest of it, first, to "the support of indigent private patients, and, secondly, to "extraordinary improvements" and "hygienic and curative agents." A large part of the report is occupied by an exposition of the distinctive traits of several forms of insanity, and of the wide field still open for improvement in the facilities for the treatment of them. Doubtless but few years will pass before this hospital will be abundantly supplied with the means of moral treatment.

P. E.

ART. XVII.—*A Treatise on the Practice of Medicine.* By GEORGE B. WOOD, M. D., LL.D., etc. etc. 2 vols. 8vo. pp. 1002—982. Philadelphia, 1866: J. B. Lippincott, & Co.

THE treatise of Dr. Wood has been before the public now for nearly twenty years, during which time it has run through six editions, and has received the almost unanimous approval of the profession, abroad as well as at home. It may now be received, therefore, as a standard authority in respect to medical doctrine and practice—a work highly creditable to its author as a professional writer and teacher, and one which is a valuable addition to the medical literature of our country.

In the edition before us every chapter bears the marks of careful revision, while the entire treatise has received such additions as were demanded by the progress of medical observation and improvement in respect to particular diseases or classes of disease; from either the opportunities which have been furnished us for the better study of their pathology, or from the light that has been thrown upon their nature and causation by the recent advances that have been made in our knowledge of the physiology of the human organism; the treatise being brought fully up to the present state of our science and art.

The work of Dr. Wood is particularly well adapted for the use of the advanced medical student; as well of those who have recently entered upon the practice of their profession, and who still feel the necessity for some reliable guide to direct them in their clinical study of diseases and their remedies. It is sufficiently full, clear, and accurate in its description of the maladies of which it treats, and perfectly sound and consistent in its pathological teachings, while its therapeutical directions are those which have received the sanction of the most experienced and successful practitioners of this country and of Europe. There is no attempt in any part of the treatise to attract attention or elicit applause, by bewildering generalities, or startling novelties in doctrine, or unusual plans of cure. The single aim of the author from first to last has evidently been to impart, with plainness and simplicity, useful and well-established truths, pathological and therapeutical, to serve as a guide alike to the student and young practitioner of the healing art.

We could have wished that the author had embodied in the text the greater part, at least, of the matter now contained in notes at the bottom of the pages, the reduction effected in the bulk of the volume by the use of these notes is no adequate compensation for the awkward breaks, in the course of the instructions caused by the repeated consultation of foot-notes.

D. F. C.

ART. XVIII. — *Practical Treatise of the Physical Exploration of the Chest and Respiratory Organs.* By AUSTIN FLINT, M. D. Second edition, revised. 8vo. pp. 595. Phila.: Henry C. Lea. 1866.

THE present edition of this valuable and well-known work contains a very full account of the physical examination of the thorax. It seems to us, however, to be much too extended for the use of students. The history of the signs is, in the main, well developed and accurately described. The author quotes largely from different European writers on the subject, although some American authors might justly complain of not receiving a single citation.

The main descriptions are well detailed, although we do not agree with all the author's remarks; for instance, he says:—

"In practising immediate auscultation it is well to accustom one's self to the use of either ear indifferently, if the sense of hearing be equally acute in both."

Now, from a vast deal of experience in teaching young men during the last thirty years, we are satisfied that a very small proportion can use both eyes or both ears equally well. Indeed, if they possess this acuteness of hearing equally well in both organs, the habit of cultivating one of them especially, will give it an extraordinary power much greater than could be attained by both.

Distinction between the crepitant and sub-crepitant rhonchi is not clearly pointed out, nor is the crepitant rhonchus stated to belong exclusively to the act of inspiration. Besides, the crepitant-rhonchus is not really the first sign of pneumonia. This is always a rude respiration, crepitant rhonchus appearing generally a day or two afterwards; sometimes, however, the crepitus begins, although very rarely, with the very first symptoms. In these cases we believe that the rhonchus is heard because the interval has been passed over, before the examination of the patient, in which congestion of the lung produces a rough sound of respiration previously to the crepitation. For the crepitus is produced in the vesicles and finest tubes after the mass of the lung is filled with blood, which condition of course makes the respiration rude. In every case we believe that this occurs before the minute tubes and vesicles impeding the passage of the air by their stiffness, produce true crepitus.

The friction sound of pleurisy is not well described by the author. Friction is always heard at the very earliest stages of pleurisy, unless in those cases in which there is but little pain in the thorax, although the pleura is without a consistent or genuine example of the sound. It is slight, but is easily recognized by any one carefully seeking for it, because it is felt as well as heard, and even to the ear, although the sound is sometimes very slight, it does not at all resemble any variety of proper bronchial rhonchus. The peculiarities of the friction sounds of pleurisy were long ago pointed out in this city, and have been explained to the students every year.

The fact of which the author is aware in certain cases only, is, as we have already stated, the regular occurrence of rude respiration at the very beginning of pneumonia. The error is, that he has not said always, for it certainly does occur whenever the patient is examined at the very first stages of the disease, although sometimes a very short time elapses before the occurrence of crepitation.

"In some instances, while the area of the inflamed lung is limited, especially if it be situated near the surface, a broncho-vesicular respiration precedes the appearance of other signs."

We are not however disposed to extend our inquiries into the smaller matters upon which the author has been led into error. In the main the book is a very good one, with the exception of its too great diffuseness, which must impair its usefulness for students of physical exploration. It contains, however, a very complete account of the subject. W. W. G.

ART. XIX.—*A Practical Treatise on Fractures and Dislocations.* By FRANK HASTINGS HAMILTON, A. B., A. M., M. D., Professor of the Principles of Surgery, Military Surgery and Hygiene, and of Fractures and Dislocations in Bellevue Hospital Medical College; Surgeon to Bellevue Hospital and to the Charity Hospital, New York; Professor of Military Surgery, etc., in the Long Island College Hospital; author of a Treatise on Military Surgery. Third edition, revised and improved, illustrated with two hundred and ninety-four wood-cuts. 8vo. pp. 777. Philadelphia: Henry C. Lea, 1866.

ON the appearance of the first edition of this valuable treatise, in 1860, it was fully reviewed in this Journal (see number for April, 1860, p. 419, et seq.), and the opinion expressed that it well supplied a want long felt in surgical literature, and that it would take rank as a work of classical authority. This judgment has since been confirmed by every reviewer, both in this country and abroad, as well as by the profession generally.

Since the publication of the original edition, the author's experience has been largely extended in military hospitals and in the ample fields of instruction afforded by Bellevue and Charity Hospitals, New York, as well as in private practice; and the results of this experience, and also the information gleaned from the careful study of the cases and observations recorded in recent journals, have been incorporated in the present edition. Several changes have been made in the illustrations and some new ones added. The frequency with which even surgical writers confounded epiphyseal separations with fractures, has determined the author to select from Gray's excellent treatise upon Anatomy a number of illustrations indicating the centres of ossification and the subsequent development of bone. The chapter on "Gunshot Injuries" has been enlarged by the addition of a few statistics obtained from the published records of both armies.

These additions make the work much more valuable, and it must be accepted as the most complete monograph on the subject, certainly in our own, if not even in any other language.

ART. XX.—*Orthopedics: A Systematic Treatise upon the Prevention and Correction of Deformities.* By DAVID PRINCE, M. D. 8vo. pp. 240. Philadelphia: Lindsay & Blakiston, 1866.

THIS treatise upon Orthopedics has been prepared, the author states in the preface, with special reference to the wants of physicians engaged in general practice. He has succeeded admirably in preparing a work which will be of great assistance to men busily engaged in practice who desire to quickly learn how deformities are most readily and surely to be prevented and remedied. To such persons we recommend this treatise as beyond all comparison the best that we have seen.

The book is well printed, and illustrated by ninety-three wood-cuts.

W. F. A.

ART. XXI.—*Elements of Medical Chemistry.* By B. HOWARD RAND, M. D., Professor of Chemistry in Jefferson Medical College. 12mo. pp. 399. Philadelphia: T. Ellwood Zell & Co., 1867.

THERE are two objects which may be held in view in preparing scientific works. They may be designed to promote the knowledge of the science of which they treat, by recording and collating new facts, or arranging known facts in new

lights with reference to more enlightened theoretical views, or they may aim to bring familiar facts and accepted explanations to the view of minds hitherto unacquainted with them, and especially to give them some practical and useful direction. To this latter class belongs the little work of Dr. Rand. It does not profess to go into details, but presents the general principles of chemistry in a concise form, and treats of the relation of the science to medicine. It is rather more concise than would be considered best for a student applying himself to master even the limited branch of knowledge which has been termed medical chemistry; but in view of the cramming system, almost of necessity adopted in our medical schools, it seems a useful book, and has the great merit of being up with the times. We notice among the paragraphs under the head of Analysis, one devoted to spectral analysis, the process by which the new metals Cæsinum, Rubidium, Thallium, and Indium have been discovered, and by which the constitution of the sun and stars have been recently investigated. Dialysis is also described. Under the head of Dynamical Electricity, the galvanic or Voltaic and electro-magnetic phenomena are somewhat illustrated, and their medical applications receive attention. The peculiar influence called by some *presence*, by others *catalysis*, by which ferments act, in starting decomposition, the rationale of which is not known, is designated, after Liebig, as "*Example*," a term more familiarly recognized in human affairs than in the movement of inanimate atoms. Under the head of Organic Chemistry, numerous chemical products are briefly described, and something like a classification attempted, but it is hard to embrace within the limits of a brief treatise even a glimpse of that expansive science which in our time has opened such vast resources to medicine and to the arts. To adapt this book more perfectly to the uses of the student, it has an Appendix containing Tables of Weights and Measures, Incompatibles, Antidotes, List of Minerals with their Chemical Composition, and a Glossary. E. P.

Art. XXII.—*Food and its Digestion.* Read before the Albany Institute, February 27th, 1865. By Howard Townsend, M. D., Professor of Physiology and Materia Medica, Albany Med. Coll. 8vo. pp. 18. Albany. 1866.

This very slight and imperfect sketch of the subject indicated on its title page, was read before a non-professional audience, and was one, perhaps, sufficiently full in its details, and handled with sufficient scientific accuracy for the wants and appreciation of such an audience, and better adapted to lure them to a more intimate study of the subject, than would be one distinguished for its profundity and exhaustive range. For those destined to the study and pursuit of the science and practice of medicine it is altogether unadapted. In this latter character, however, it is but justice to its author to say that he never thought of presenting it. D. F. C.

Art. XXIII.—*Genito-Urinary Fistulæ.*

1. *Des Fistules Génito-urinaires chez le Femme. Par* Ignacio Rodriguez Da Costa Duarte. 8vo. pp. 96. Paris: J. B. Baillière & Son, 1865.
Female Genito-urinary Fistulæ. By Da Costa Duarte.
2. *A Treatise on Vesico-Vaginal Fistulæ.* By M. Schuppert, M. D. Surgeon of the Orthopædic Institute at New Orleans, La. 8vo. pp. 36. New Orleans: 1866.

1. The author of the first of these publications is evidently a Portuguese: he seems to us to have thought, even if he did not originally write, in that language; hence, his French is not at all times clear and easy of translation.

However, this *brochure* on *Genito-urinary Fistules in the Female* is quite a meritorious production, and worthy of being better known than it can be while veiled from so many professional readers by the language in which it is published.

The author divides *Genito-urinary Fistulæ* as follows: *urethro-vaginal; vesico-vaginal; urethro-vesico-vaginal; vesico-utero-vaginal; urethro-vesico-utero-vaginal; vesico-uterine;* and *uretero-uterine*—a classification which, while anatomically correct, is practically the best, and is very nearly the same as that made by Jobert.

In the general discussion of the *etiology* of these lesions he makes the subjoined statements as to *Age, Previous Accouchements* and *Instruments*:—"The elasticity of human tissues is inversely proportionate to the age, and it is at an advanced age that we frequently meet with hypertrophy of the uterine neck which would much delay its dilatation. Nevertheless, I think that primiparæ who are advanced in life are very liable to genito-urinary fistulæ; but multiparæ are not less liable, in the same condition of age, because in addition to the hypertrophy of the uterine cervix which may exist, an additional obstacle to its distension would be found in the inodular tissues resulting from laceration in previous labors. * * * Availing myself of the statistics published by Monteros, *Essay upon the Treatment of Genito-Urinary Fistulæ in the Female*, Paris, 1864, and of D'Andrade, *Essay upon the Treatment of Vesico-Vaginal Fistulæ by the American Method*, Paris, 1860, I find that the first gives 121 cases of these different fistulæ, and the second 68. Deducting from the joint number 16 cases in which the age is not recorded, of the 173 which remain there were but forty under twenty-five years of age, and only six under twenty; this seems to me to prove that advanced age favours the occurrence of these lesions. In the same statistics, omitting 16, in which the number of accouchements is not stated, we find that 78 of the 173 were primiparæ; this proportion of less than one-half establishes my assertion. M. Monteros has published three very remarkable cases; one of an accouchement occurring at sixty years, a primipara at fifty, and another fifty-one."

Our author states his belief that the applications of instruments, and the manipulations which they require, constitute the cause of these lesions in many cases. For our own part, we fully believe that delay or neglect in resorting to instruments in protracted labour, has more to do ten times over with their production than all the instruments, obstetrical or surgical, that were ever made use of in this part of the body. When we remember that the large majority of practitioners never resort to forceps, or craniotomy instruments, when we hear now and then of women being permitted to remain in labour two, three, or four days, our only wonder is that these maladies are not more frequent. Only yesterday we examined a patient with vesico-uterine fistula, which had its origin fourteen years ago in a labour which was allowed to continue four days, the child hydrocephalic, before operative measures were resorted to; here it was not the puncturing on the fifth day of the distended fœtal head, but the failure to do this on the first or second day, which caused the mischief.

While referring to the *etiology* of these maladies, we cannot forbear mentioning a case which was presented to Wutzer, where the fistula resulted from the effort to restore the vaginal canal—(the fistula was cured by thirty-seven cauterizations!)—since it had an uncommon cause, and at the same time illustrates one of the dangers of this difficult operation, an operation which even in the skilful hands of Amussat, did not always terminate well, so that some in preference to attempting it have resorted to rectal puncture (see Dr. Oldham's report of two cases thus treated, *Guy's Hospital Reports*, 3d Series, Vol. III.), where the uterus has, subsequently to the vaginal occlusion, become distended with menstrual secretion.

Passing from this general consideration of the *causes*, we have, in order, the relative *frequency*, the *pathological anatomy*, the *symptoms* and *diagnosis*, and the *treatment*. Then follows a similar discussion of each of the several varieties of these fistulæ. We have given us with all its details, from Jobert's *Traité des fistules vesico-uterines*, the important case in which the history of the production of the fistula and the post-mortem appearances of the subject have

been so carefully recorded by Professor Stoltz, of Strasburg, as well as the very extraordinary case which occurred to Mr. Lane (*Lancet*, February, 1865), where this distinguished surgeon, after closing the os uteri for a vesico-uterine fistula most satisfactorily, subsequently, in consequence of uterine distension and distress, punctured the uterus, the puncture being followed, to his great surprise, by an abortion of a four months' fœtus; and again closure of the os uteri was successfully resorted to. The reports of these two cases, with one from Baker Brown, make up nearly one fourth of the volume.

Our author confines himself, in giving operative procedures, to three—those of Jobert, Simon, and Sims, declaring, as is just, his decided preference for that of the last. These methods are so familiar to all surgeons that it is needless to mention them. There is a point omitted, however, in the description of Simon's method as we understand it, and which seems to us of some practical value; this is in the way in which resection of the fistulous edges is done—first penetrating with a pointed bistoury the entire thickness of the tissue to be removed, and then inserting a blunt-ended bistoury in the opening thus made, and cutting round the fistulous border—a method which would greatly help to secure two important desiderata in these operations, regularity and completeness of freshened surface.

The third and last chapter of this work is upon *Treatment of Lesions regarded as Incurable*, in which, after alluding to closure of the vaginal outlet as a remedial measure suitable for certain cases, a case presented to the author is adduced in which there was "rupture of the anterior wall of the vagina, obliteration of the urethra and complete section of one part of this canal, displacement of the bladder and prolapse into the vagina, rupture of the inferior fundus of the bladder, narrowing of the vagina, great constriction of that portion of it embracing the neck of the uterus, and uterine retroversion."

The urethra might be made permeable, and the vulva occluded, but how prevent urinary incontinence? Here is the author's suggestion[1] as to an operation preliminary to closing the vaginal outlet, an operation which the patient was unwilling to submit to, but which strikes us as being quite feasible, and might be well worthy of being resorted to in a similar case. "The basis of my proposed operation consists in making use of the sphincter of the anus to retain the urine; and for this purpose I propose to make an opening through the posterior wall of the vagina into the rectum, getting as far above the sphincter as possible, and at the same time carefully avoiding the utero-rectal cul-de-sac."

In conclusion, we have been much pleased with this monograph; we only wish that with the same excellence of general design and arrangement, there had been more of detail—a more thorough and complete discussion of the whole subject.

2. We have given so much space to the consideration of the first of these publications that our remarks in reference to the second must be brief. The latter contains in addition to the thirty-six pages, large octavo, text, several lithographs, the excellence of which is not striking, representing the instruments used by the author, and some sixteen cases of vaginal fistulæ.

The treatise embraces the following subjects discussed in order: Definition; Causes; Operation; After-Treatment; Cases; History of the Operation.

Dr. Schuppert, under the head of *Causes*, observes very justly, as we think, though in opposition to the statement of an American author on Diseases of Women, that "in the majority of instances a vesico-vaginal fistula originates through the mortification of a portion of the vagina and bladder, in consequence of these parts being compressed by an impacted portion of the fœtus, the head or breech pressing against the os pubis, thus preventing circulation of the blood in the tissues involved." But his statement that in the majority of cases the injury happens in the first labour, would seem to be contradicted by the statistics already given from Da Costa Duarte.

Dr. S. gives a very clear and full account of his method of operating and of the after-treatment of his patients, which are in most respects the same as are

[1] This plan is really that of Maisonneuve.

adopted by operators at the present day. The differences are, 1st, his sutures penetrate the entire thickness of the fistulous border, having before his eyes no fear of irritating the vesical mucous membrane; 2d, he uses injections of cold water every thirty minutes for the first forty-eight hours after the operation; and 3d, he dispenses with opium as an essential in the after-treatment. As to the first, other operators have done likewise in placing their sutures, among whom we may mention Dr. Hayward; but the general verdict of operators is against the plan, and we do not believe it is based upon sound theory, or upon generally successful results. As to the second, a similar practice was resorted to by Esmarch, whose success in the treatment of vaginal fistulæ, we believe, was quite equal to that of Simon.

In addition to several cases of fistulæ[1] successfully treated, with two exceptions, in the usual method, Dr. Schuppert here reports two cases of *obliteration of the vagina*, one of which was obtained by the method known as *episiorraphy*. Even what is known as *transverse obliteration* of the vagina much oftener fails than succeeds; the statistics in Professor Günther's *Operative Surgery* give nine cases and only one of them successful, while episiorraphy was resorted to thrice in one subject, and failed; it has failed too in other hands, not only failed of a successful result, but in at least two subjects been followed by death; we believe Dr. Schuppert is correct in claiming for himself the first successful case in which this operation has been performed, and it is proper that he should be congratulated upon the fortunate result.

The author gives a *résumé* of the methods of treatment of vaginal fistulæ which have been resorted to in France, Germany, England, and America. Nevertheless, this is not complete, nor do we think it entirely free from erroneous statements. Illustrative of the former, among French operations we do not find any mention of Maisonneuve (which our author will spell Massonneuve), separating the urethra from the pubic arch having similar object as Jobert's partial detachment of the vagina from the cervix uteri, a practice which has been imitated by some other operators, and which might in some cases be very advantageous; illustrative of the latter, when he refers to German operators, we find Nægelè spoken of as having operated in a particular way, "uniting the edges with small tape and the interrupted suture," &c. But in the work by Professor Günther, just referred to, Dr. Benno Schmidt, who is the author of the very complete chapter on the *Operative Treatment of Vesico-Vaginal Fistulæ*, uses the following language: "The disused suture was again brought into notice by Lewzisky in 1802, and by Nægelè in 1812. Both, however, simply proposed, without ever executing the plan upon any living person."

Upon the whole we have found ourselves well repaid for the perusal of Dr. Schuppert's treatise, though we cannot fully appreciate its *grandiloquent* dedication to the "Czar of all the Russias," nor can we commend the *brusqueness* of some of his remarks on the methods of contemporary surgeons.

In terminating this notice, we cannot forbear calling attention to two instruments recently invented, which we think quite useful in some of the operations for vaginal fistulæ, and which we would be glad to have seen mentioned by Dr. S. The one is designed for very small fistulæ situated high up in the vagina, and consists of a curved steel sound provided with four elongated points—a sort of harpoon which being first thrust through the fistulous opening and then partially withdrawn, catches and holds the edges so that they can be readily pared; this is the invention of Dr. Banon, of Dublin. We are pleased to see that Dr. Agnew, of Philadelphia, speaks well of this instrument, though the name of the inventor is not mentioned. The other instrument which we wish to mention is the "guide" made use of by Mr. Bryant, of Guy's Hospital, the advantages of which are the completeness, the readiness and regularity with which

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[1] One patient died of *pyæmia* eight days after the operation, and another succumed to tuberculosis nine months after being operated upon, and the fistula diminished, not cured. The author's fourteenth case is given as *urethro-recto-vesico-vaginal fistula*. But that there is no such fistula as this must be obvious—there were two *fistulæ*, the one *urethro-vesico-vaginal*, and the other *recto-vaginal*.

the fistulous margins are resected. For drawings of this instrument, with one, two, or three prongs, and as modified for transverse or vertical fistulæ, as well as a full explanation of the method of using them, the reader is referred to the last volume of *Guy's Hospital Reports*. T. P.

ART. XXIV.—*Cancer: A New Method of Treatment.* By W. H. BROADBENT, M. D., London, Assistant Physician to St. Mary's Hospital, &c. 8vo. pp. 28. London: John Churchill & Sons, 1866.

THE main facts contained in this pamphlet were brought before the British Medical Association at its last meeting, but the paper was so curtailed in publication as to defeat the purpose of the author in bringing the subject fully before the profession, and hence he has been led to publish it in its present form.

The idea presented itself to the mind of Dr. Broadbent, that, by means of the hypodermic syringe, some fluid might be injected into a cancerous tumour, which might so far alter its structure, and modify its nutrition, as to retard or arrest its growth. After some reflection acetic acid was selected for the following reasons:—

"1. This acid does not coagulate albumen, and might therefore be expected to diffuse itself through the tumour. The effect would thus not be limited to and concentrated in the point injected.

"2. If it entered the circulation it could do no harm in any way, either by acting as a poison or by inducing embolism.

"3. Acetic acid rapidly dissolves the walls and modifies the nuclei of cells on the microscopic slide, and might be expected to do this when the cells were *in situ*.

"4. It had been applied with advantage to open cancer and to cancerous ulcerations.

"The experiment was made, and it was found that acetic acid, though in healthy tissues it causes very severe smarting and burning, unless very strong, gives little pain when thrown into malignant structure. On the other hand it acts energetically on cancer, but has comparatively little effect on normal structures."

Four cases on which these conclusions are based are given in detail in the pamphlet under notice. These cases Dr. B. thinks "sufficiently establish the correctness of the anticipation formed as to the action of acetic acid—that no unfavourable results arise from absorption of the acid into the blood—that it permeates every part of the tumour more completely than would any fluid coagulating albumen—and that it acts energetically on cancerous structures. Even in a comparatively dilute state, and when it cannot be looked upon as in any sense caustic, it breaks down the substance of malignant tumours. The process seems more like solution than sloughing or suppuration, and is not necessarily attended with pain or constitutional disturbance. The first case furnishes the most striking illustration of the remarkable influence of acetic acid. The result of the first injection went beyond my anticipations, and produced an effect I had not anticipated, and did not at the time desire. As I could see the patient only at rather long intervals, the caution always necessary in early experiments of this kind had to be redoubled. In a similar case a much shorter time would now suffice to bring about the same result. It is certain, however, that different cases will demand special modifications of the treatment; some may require stronger acid, others weaker; some long intervals between the injections, others short; in some it may be better to throw in the acid quickly; in others very gradually. These points can only be settled by experience.

"It has not yet been demonstrated that a malignant tumour may be entirely and cleanly rooted out at once. At its periphery, where diseased joins on to healthy structure, it has more vitality than in the centre, and in the case referred

to, great difficulty was experienced in removing the portions left behind when the mass of the tumour had been destroyed. Much more pain was given in this attempt than in the previous proceeding. A considerable portion of the wall of the cavity was, however, from the first, denuded of malignant structure, and there seems to be no reason why this should not have been the case at all points, had the injections been more complete. This result should always be aimed at when the removal of an unbroken tumour is undertaken.

"As to the pain resulting from the injection of acetic acid, the difference between cancer and healthy tissue was remarkable in all the cases. In the first: acid, which had caused scarcely any pain when injected in considerable quantity into the substance of the tumour gave rise to acute smarting, when a single drop entered the subcutaneous connective tissue. This was still more strikingly shown in the case of the axillary glands. In the cancer of the rectum the occurrence or not of pain was an invaluable indication as to whether the point of the needle was in the substance of the tumour, or in healthy structures, or free in the canal after passing through a nodule of cancer, or gliding over its surface. The difference was by no means so marked in the case of epithelial cancer of the tongue, and in another instance of this form of cancer I have seen the same thing. Within the last few days I have also found injection of a solid tumour to give considerable pain, and Mr. I. B. Brown, jun., has stated to me that this has occurred in a case under his care, so that immunity from suffering is not always to be counted upon."

The theoretical grounds upon which Dr. B. founded his hope that the vitality and nutrition of cancerous growths might be so far modified as to check their progress and dissemination without necessarily causing their suppuration or sloughing, he states to have been as follows:—

"1. Cancer owes its malignancy, not to any peculiarity of chemical composition, but to its characteristic structure. It is made up of cells (to employ a terminology almost antiquated), which, retaining more or less the fœtal type, retain also the fœtal capacity for indefinite multiplication, but do not undergo development into perfect tissues. To alter these cells will be to put an end to their power of dividing and multiplying, and consequently to arrest the growth of the tumour.

"2. In acetic acid we have an agent which, on the microscopic slide, rapidly effects important changes in cells of every kind, dissolving the cell-wall, and affecting the nucleus. Not coagulating albumen it may diffuse itself through a tumour, and reaching every part equally it may probably produce similar results when the cells are *in situ*.

"Experimentally, it has been seen that acetic acid does diffuse itself as was anticipated, and a striking proof was afforded of this fact in the very first injection practised. Again, it has been found that it attacks the cells so effectually as completely to destroy their vitality and produce solution of the tumour. The point to be determined is, whether it may not be so applied as to stop short of this result and alter the cells, impair their vitality, modify their nutrition, or even dissolve or destroy them, but leave any fully organized tissue, or remains of the invaded structures. The tumour would, in this case, cease to spread, and would shrink and contract."

In considering the application of this treatment to various cases, Dr. B. remarks: "There are two distinct results which may be aimed at: the yet uncertain effect last spoken of, arrest and withering of the tumour, or its death and removal.

"The former might be sought in any example of accessible tumour, in which the skin is not involved. Cases of scirrhus would seem to be those in which success might, with most reason, be hoped for, as more fibrous structure is found in them, and a tendency to shrinking and withering is often seen in this class of tumours.

"The destructive effects may be looked upon as always in our power—whether this should be resorted to in all or in many cases, must be determined by experience. In cancer of the rectum, it offers a valuable means of removing obstruction and relieving pain. In the case described, it has lengthened life. It may, perhaps, do more. In cancer of the uterus it will, probably, be found of

equal or greater service, and the application will certainly be easier than to disease of the rectum.

"In epithelial cancer of the integument, or of the tongue, a difficulty is met with from escape of the fluid at the surface. Experience alone can determine the value of the injection of acetic acid, or its employment in other ways in these cases, as compared with other methods practised.

"Speaking generally, wherever treatment by caustics of whatever kind is to be preferred to removal by the knife, this method would seem to offer greater facility of employment, and to be attended with less pain. In subcutaneous tumours, if the skin were not involved, it might probably be necessary to make an incision when the cancer had been softened down, but in these cases arrest should first be attempted. When a solid tumour has invaded the skin, this will slough and leave an opening through which the *débris* may escape. In open cancer the fungous masses might be removed, and the irregular, foul, and painful ulcer, with its offensive discharge, be replaced by a comparatively clean surface, without fetor or pain."

Dr. B. says he is not prepared to lay down precise rules for the employment of the acid, but his experience inclines him to the use of a large quantity of dilute acid, rather than of a smaller proportion in more concentrated form. The strongest acid he has used has been composed of equal parts of water and of the strong acetic acid of the Pharmacopœia; the weakest, one part to four or five.

"The injection should be gradual, especially when the tumour is dense, as pain may be inflicted either by escape of the acid by the side of the needle, or by the tension caused by the fluid forced in. The indication I shall take for my guidance will be pain. When this attends any operation, I should reduce the strength of the acid and the force of the injection until it is no longer severe, and only when this has proved inoperative go on to more energetic measures. Dr. Richardson's ether spray apparatus will be most useful in preventing pain."

Dr. B. concludes his paper with the expression of his belief that the acid treatment of cancer will be found to be a valuable palliative remedy, if not in some instances curative; and that it will be applicable to cases which have hitherto been beyond the reach of any remedial measures.

Should these anticipations be confirmed by further experience, Dr. Broadbent will have conferred the greatest boon on humanity—a boon which will associate his name with that of Jenner and other great benefactors of mankind.

Dr. Broadbent's paper has attracted considerable attention in England, and several surgeons are now engaged in trying the measure which he has proposed. It is being employed in the cancer wards at the Middlesex Hospital by Mr. Moore and Mr. C. De Morgan, at St. George's by Mr. Holmes, at the Marylebone Infirmary by Dr. Broadbent and Randall, and at the Westminster by Mr. Holt. (See *Med. Times and Gaz.*, Oct. 27, pp. 444–445.)

At the meeting of the Pathological Society of London, Oct. 16, Mr. Moore stated that "having heard Dr. Broadbent's paper at the British Medical Association, he at once adopted the plan recommended. He had since treated three recurrent cancerous tumours by the injection of acetic acid, and the result was that they disappeared—not a trace of them being left. The specimen Mr. Moore exhibited consisted of two cancerous glands, one of which only had been injected. The uninjected gland contained abundance of fusiform and nucleated cells. The injected gland was reduced to a brownish stringy pulp in which pools of oil floated. Under the microscope scarcely any fusiform cells were to be found—about one to four or five fields. There were found, however, corners and angles of cells and pus-corpuscles, granular masses, and abundance of fat.

"In reply to Mr. Lee, Mr. C. H. Moore said that the injection was only practised once. There was but one outward puncture, but the fluid was sent to different parts of the tumour by altering the direction of the point of the syringe.

"Mr. Power mentioned two cases in which this plan had been tried, but he only knew the result in one of them. This patient consulted Mr. Power for a malignant growth of the eyelid. Dr. Broadbent's plan of treatment was adopted,

and with surprising benefit. The tumour rapidly vanished, and Mr. Power believed the injection had really cured the disease."

The actual value of Dr. Broadbent's method of treating cancer cannot yet be determined, but it would seem, from the results thus far obtained, to lead to the hope that it may be beneficial in at least some cases.

ART. XXV.—*Contribution à L'Histoire des Mariages entre Consanguins;* par le Dr. AUGUSTE VOISIN, Méd. de l'Hospice de Bicêtre, etc. Extrait du Tome II. des Mémoires de la Société Anthropologie. 8vo. pp. 32. Paris, 1866.
A Contribution to the History of Marriages between Blood Relations. By Dr. AUGUSTE VOISIN, Physician to the Bicêtre Hospital, Paris, etc.

IN order to collect a series of facts bearing upon the subject of marriages among near relatives, and the results of such unions upon the health, physical or mental development, and duration of life of the offspring, Dr. Voisin took up his residence, during one month of the year 1864, in the village of Batz (*Loire-Inferieure*); a place where marriages among relations is of common occurrence; and made personal observations in respect to the topography, population, pecuniary condition and occupations of the inhabitants, their customs, their health, the duration of their lives, their grade of intelligence, instruction, morality, and religious deportment.

Accurate information was obtained by Dr. V. in reference to the results of 46 marriages—5 of which were between *cousins-germain*, 31 between *second cousins*, and 10 between those of the *fourth degree of consanguinity;* leaving out of the question numerous marriages between relations of the fifth and sixth degrees, of which latter relationship he found to be the greater number of the married couples in the village. The result of the information thus derived, was that in the community of Batz marriages between persons related by blood had no injurious influence upon the children born of such marriages. That among these children there existed no vices of conformation, no mental affections, no idiocy, cretinism, surdmutism, epilepsy, or albinism. Scrofula existed in only one young girl. Sterility is almost unknown. Two only (related in the third degree of consanguinity) of the forty-six pair referred to were childless. Of the remaining 44 couples the offspring amounted in all to 174.

The most part of the children have an intelligence beyond that ordinarily observed at their age; they are lively and cheerful in disposition, and apt to acquire knowledge.

The inhabitants of Batz are longlived—preserving to the end a good degree of bodily vigour and mental power.

From his study of the question as above, Dr. V. has convinced himself that marriages of consanguinity are in no degree injurious to the children born of them, when the father and mother present no indications of any morbid diathesis, or of any hereditary disease, but are in good health, and of robust constitutions, and when they are placed under favourable conditions, climatic and hygienic. That under such circumstances, the marriages of cousins injure in no manner the immediate offspring or the race, but, on the contrary, exalt their condition.

D. F. C.

ART. XXVI.—*Acholic Diseases, comprising Jaundice, Diarrhœa, Dysentery, and Cholera. With a Preliminary Dissertation on Bile, the Bilious Function, and the action of Cholagogues.* By ALEXANDER CHARLES MACLEOD, L. K., Q. C. P. I., etc. etc. 12mo. pp. 230. John Churchill & Sons. London, 1866.

WE do not recollect to have ever perused a medical work of the same size issued within the last half century, in which a system of pathology in relation to

any of the ordinary forms of disease, is so exclusively built up on bare hypothesis—on deductions drawn from imaginary premises, without a single indisputable fact to give them even the semblance of a foundation—as in the one before us.

Dr. Macleod is not only original in his pathological views, but he is equally so in some, at least, of his views in reference to physiology. Among other novelties advanced by him is the vicarious or subsidiary office to the liver performed by the mucous glands or follicles of the intestinal mucous membrane; especially when the blood of the portal system becomes "hyper-cholerized." The intestinal follicles or glands being considered by Dr. M. as, in effect, rudimental livers.

A distinctive feature of the liver, and of every other secreting gland, is, Dr. M. remarks, the possession of an elective faculty enabling it to extract from a heterogeneous and ever varying fluid mass, just such elements as it has need of, rejecting all others. So, also, with the kidneys. The excretions of these organs consist entirely of matters foreign to the blood, and whose presence therein must consequently be hurtful. In respect to the kidneys, we know that the total suspension of their function, for even a short time, is generally fatal. The liver, it is true, separates also from the blood certain hurtful matters, but, besides this, its office is to eliminate particular elements, which almost immediately have to be restored into the blood again; it is, consequently, not to be expected that an interruption of the hepatic secretion should be attended with equally grave consequences. The addition, however, of bile being required for the due performance of the assimilative process and the production of healthy chyle, it is evident, that every diminution of the needful supply of bile must be followed by a corresponding defect in the work of digestion. Thus, when there is a minor deficiency in the supply of bile, we have, according to our author, *constipation;* when this has continued some time, "the bowels irritated by continued contact with hyper-cholerized blood, pours out mucus, converting the previous constipation into a diarrhœa." In certain conditions of the system, dependent, probably, on malarious influence, the function of the liver appears to be altogether suspended, when, according to Dr. M., a severer form of enteric irritation ensues, succeeded by "ulcerative inflammation," and constituting the most common type of *acute dysentery.*

During these temporary suspensions of the function of the liver, it is presumed that the kidneys act in a subsidiary way—removing from the blood, in a proximate or remote form, or in both, those elements that the liver has failed to convert into bile, and which, therefore, will accumulate in the blood. Should, however, whilst the function of the liver is thus suspended, the action of the kidneys be from any cause simultaneously arrested, according to Dr. M., *cholera* will then be necessarily produced.

These four affections constitute what our author has been pleased to denominate "*acholic diseases.*"

In respect to the pathology of *jaundice* as announced by Dr. M. a very correct idea will be derived from the following sentences.

As already remarked, he has assumed that the various glands with which the assimilative portion of the digestive tube is studded are probably subsidiary to the liver; perhaps, some or all of them are rudimentary hepatic acini, but having their functions somewhat modified by their different position, and their different relation to the great source of bile, the portal system. Although from their structure and position these glands may be supposed, Dr. M. remarks, to be the only organs endowed with the vicarious or subsidiary office of secreting a pseudo bile, yet, he asserts, that in nearly every tissue of the body, under exceptional circumstances, bile may be found. Yet he would not say that the several tissues have special bile secreting powers. It is more probable that the hepatic bile—bile secreted by the liver—not finding a free passage into the duodenum is conveyed into the general circulation, and distributed throughout the tissues by exosmosis; and being bland and unirritating its presence there is unproductive of injury. Spurious or factitious bile, however, deposited in any portion of the body has, Dr. M. infers, like that poured into the intestines, an irritant or other noxious property.

A bilious tinge sometimes pervades the body in cases where it cannot be due

to hepatic or cystic bile, in consequence of the function of the liver having become destroyed by organic or other disease. Here, it is evident, that the constituents of the bile, remote or proximate, must necessarily accumulate in the blood, inducing a condition of "*hyper-cholerization*," as Dr. M. denominates it. This condition may become externally manifest by deposition in the tissues, thus constituting one form of jaundice. But Dr. M. believes that the biliary constituents may remain unseparated from the blood, and by their presence cause diarrhœa, dysentery, or colic. The biliary constituents may even, he supposes, be deposited in the tissues without being evident to sight. We may thus have all the conditions of jaundice without the colour, which is probably the case, he thinks, in some forms of diarrhœa, dysentery, and cholera.

"Thus," says Dr. M., "there appears to arise a natural distinction of all forms of jaundice into two great classes: one in which bile has been duly secreted by the liver, and subsequently distributed throughout the body, instead of being poured into the duodenum; another, in which the biliary constituents have not been combined by the liver, and consequently pass on into the general circulation in some abnormal and highly morbific condition. This latter is a state of '*acholia*,' and acholia produces '*cholæmic*' poisoning, just as anuria produces uræmic poisoning."

The pathology of *cholera* advocated by Dr. M. will be understood by a perusal of the "argument" prefixed to his chapter on that disease.

"Cholera is an imponderable matter, or condition of matter; tellurial in its origin; existent in and with the atmosphere, but forming no component part of it, being of it as independent as are the rays of light; attracted by some other matter or condition of matter, existent in and peculiar to the human body. Where a great space, as a continent or arm of the sea, intervenes, the earth itself may become the conducting medium."

"When present, that is, in the atmosphere or supra-tellurial, it is attracted, and more or less neutralized, by every, even the healthiest, human body. In certain states, however, of the body, varying from health, the force of attraction is stronger, and the process of neutralization, also, more active and conspicuous. So long as the vital powers are sufficient to keep up this process of neutralization, and so preserve an equilibrium, the system is not overcome by the disease. But under unfavourable conditions, the powers of life are not adequate to carry on, through the lungs, a continuous process of neutralization. The poison is then, of necessity, conveyed through the lungs into the blood. Being there, a far more energetic process for its neutralization is required. A violent convulsion of nature ensues, and the symptoms of 'cholera' are produced."

A work built up, like that before us, of hypotheses piled upon hypotheses scarcely requires any comment. If it be replete with truth, we shall wait contentedly until those truths be proven. D. F. C.

ART. XXVII.—*On Cancer: its Allies and Counterfeits.* By THOMAS WEEDEN COOKE, Surgeon to the Cancer Hospital and to the Royal Free Hospital, late President of the Harveian Society of London, Orator for the year 1866 to the Medical Society of London, etc. etc. 8vo. pp. 226. London: Longmans, Green & Co., 1865.

THIS work is one of great value, from its affording useful aid to the practitioner in the diagnosis and treatment of cases which subject him continually to much trouble and anxiety. The author has studied for more than twenty years, under very favourable advantages, cases of cancer, and he presents here the results of his observations. As a practical treatise *on the diagnosis and treatment of cases of cancer* we can warmly praise it. The author is an accurate and minute observer; he describes clearly what he has seen, and the text is aided by very appropriate and well-executed illustrations. He abounds in resources for combating symptoms and conditions.

It is as a practical treatise alone, however, that we regard this work of value. The author's theoretical views as to the nature and cause of cancer are not only unproven, but, probably, unsusceptible of proof.

"Cancer," Mr. C. says, "is the quaint term applied to a growth which is alien to the natural tissues of the body, and does not undergo those morphological changes which belong to the healthy structures of men." This definition, is irreconcilable with Mr. Cooke's own theory of the nature of cancer, namely: "that it is no new heterogeneous substance which is deposited among the healthy tissues, but an alteration only of the natural cell-growth or germinating material, which has lost its power of forming healthy structure." (p. vii.)

W. F. A.

ART. XXVIII.—*On Winter Cough, Catarrh, Bronchitis, Emphysema; with an Appendix on Some Principles of Diet in Disease.* A Course of Lectures delivered at the Royal Infirmary for Diseases of the Chest. By HORACE DOBELL, M. D., etc. 12mo. pp. 184. London: J. Churchill & Sons, 1866.

IN the pathology of the diseases inscribed on the title-page of the work before us, as laid down by Dr. Dobell, there is very little to criticize, nor is much fault to be found with his account of their therapeutical management. But we do most pointedly object to the name he has adopted—"Winter cough,"—merely because this "expresses the one conspicuous symptom common to them all." We object also to erecting into a new disease—morbid conditions which have little in common save a cough, that is especially prominent in the winter season.

The cases comprised under the name Winter cough Dr. B. arranges into five clinical groups, namely: 1. Cases marked by the physical signs of emphysema, with an absence of those of bronchitis; of the previous presence of which affection there is no history. 2. Cases attended by the physical signs of emphysema, but not of bronchitis, but having a history of the previous presence of the latter disease. 3. Cases in which there are physical signs of bronchitis, but not of emphysema. 4. Cases in which there are physical signs of emphysema and of bronchitis. 5. Exceptional cases, in which there are no physical signs of either bronchitis or emphysema.

It is evident that in the study of the general pathology and therapeutics of the diseases of the respiratory organs, we acquire the necessary knowledge of the nature and phenomena of the affections grouped together under the denomination of "Winter" cough; there was scarcely needed any treatise appropriated exclusively to their consideration.

D. F. C.

ART. XXIX.—*A Handy-Book of Ophthalmic Surgery for the use of Practitioners.* By JOHN Z. LAURENCE, F. R. C. S., M. B. (Univ. Lond.), Surgeon to the Ophthalmic Hospital, Southwark, &c. &c. &c., and ROBERT C. MOON, House Surgeon to the Ophthalmic Hospital, Southwark. With numerous illustrations. 8vo. pp. 191. Philadelphia: Henry C. Lea, 1866.

THERE is no department of medicine in which greater and more important advances have been made within the last few years than in Ophthalmology. The employment of the ophthalmoscope has invested the diagnosis of various affections of the eye with the same precision and certainty that the stethoscope has effected in the diseases of the lungs; and many cases are now successfully treated which would formerly either have been erroneously managed or abandoned as hopeless; and in others the patient is saved from the infliction of useless medical or surgical procedures. The recent scientific researches of Donders and others into the anomalies of refraction and accommodation, the means of

determining them, and the measures for remedying them, has also opened an extensive field, the cultivation of which has yielded a profitable harvest.

The aim of the authors of the volume under notice is "to bring the principles and practice of modern ophthalmic surgery within a small compass, to supply the wants of the busy practitioner, who may have neither time nor opportunity to read the innumerable contributions that ophthalmic surgery and science have received within the last fifteen years."

This object the authors have accomplished in a highly satisfactory manner, and we know of no work we can more highly recommend to the "busy practitioner," who wishes to make himself acquainted with the recent improvements in ophthalmic science. In some few instances, however, we have to express the fear that in the aim to be brief, so as to adapt the book to the wants of the general practitioner, important practical points are sometimes passed over in too cursory a manner, and therapeutical measures enumerated, as practised, without comment, which should only have been mentioned to be reprobated. Thus it is stated "inoculation of the conjunctiva with the pus of ophthalmia neonatorum, or the removal of the ocular conjunctiva, have also been extensively practised in obstinate cases of granular lids." These measures, we conceive, should not have been mentioned unless to be denounced as unscientific, barbarous, and ineffectual.

There is one other point to which we would draw attention; it is in regard to the treatment of obstructions of the nasal duct. "The first step," say our authors, "is to slit up the canaliculus (generally the lower one). Thus, as first shown by Mr. Bowman, we are enabled to introduce probes of considerable size into the sac."

This first step we deem entirely unnecessary, the canaliculi being as readily dilatable as any other portion of the lachrymal passage, and by patience and taking a little time, a sufficiently large probe to gain the desired end may be introduced through them to dilate any stricture in the nasal duct. We speak confidently on this point from an experience of forty years in this mode of treatment.

The only case in which the slitting up of the canaliculus is advisable is where the punctum is everted or obliterated.

The chapter on the ophthalmoscope, with directions for its use, is excellent, as are also the chapters on vision and the optical defects of vision. The authors have evidently studied these subjects thoroughly, and the chapters devoted to their consideration cannot be read without profit. The student will find condensed within a small space a most clear and instructive account of the results of recent investigations in regard to these subjects. Such a work as this was much wanted at this time, and this want Messrs. Lawrence and Moon have now well supplied.

ART. XXX.—*An Introduction to Practical Chemistry, including Analysis.* By JOHN E. BOWMAN, F. C. S. Edited by CHARLES L. BLOXAM, F. C. S. Fourth American from the fifth revised London edition. 12mo. pp. 351. Philadelphia: Henry C. Lea. 1866.

THIS very useful work has been noticed heretofore when former editions have been presented to the attention of American chemists, and has won for itself sufficient acceptance to insure the success of each successive issue. The present volume claims for itself an additional appreciation not entirely founded on previous merit, but because it has in part undergone a thorough revision and rearrangement calculated to render the methods of examination more easily understood, and to facilitate the progress of the learner in acquiring dexterity in chemical practice. The first alteration which strikes the attention and upon which there is much room for difference of opinion, is the entire omission of the symbols representing a chemical compound, and consequently the formula expressive of the reactions which take place in the processes under consideration. The followers of the unitary system of notation seem to have multiplied to such an extent among those for whom this Introduction is more especially in-

tended, that the author or editor felt himself compelled to adapt the notation to this view, by which the formula adopted "would have been comparatively unintelligible to those students who had been accustomed to the older system," or entirely omit this feature in the present volume. To those who cannot yet perceive that this system will live longer than others which have risen into notoriety to lapse into forgetfulness, the decision to omit must be acknowledged to appear the better judgment, and this more especially as it is to be presumed that the student previous to his entering on a course of study of practical chemistry, will have acquired elementary instruction in theoretical chemistry sufficient to construct for himself notation and formula according as he may prefer the binary or unitary system.

The alterations and additions to the practical part of the work are calculated to meet with approbation. Among these may be noted the arrangement of the blowpipe tests systematically together under the different metals, placed in alphabetical order, instead of being scattered throughout the work. To the beginner this is very advantageous, as in many instances the blowpipe essays give very important hints, and the facility which this plan gives of comparison, will lead to its more extended use, than when there is delay or difficulty in seeking it out in scattered parts. The different processes of investigation are in some instances improved by the more specific directions which are given as to the mode in which they are to be conducted, and attention to the directions cannot fail to insure accuracy in the results. The most important change is in the third part, the qualitative analysis of substances of unknown composition. This part has been entirely rewritten, and presents but little of its former appearance. The principle of discrimination by exclusion is here carried out to its full extent, and the operator is led on step by step from a wide range of probabilities, down to the actual substances present without danger, with ordinary care, of overlooking or missing any of the ingredients. This plan would appear to be, and to the practised operator is in most instances, too tedious and fraught with waste of time to be universally adopted, but for the commencing student is one in the highest degree instructive, and to be followed out in all its detail until experience has sufficiently formed the judgment when more direct methods may be pursued. The reactions by which various compounds may be detected have been extended so as to embrace acids (tannic, gallic) and alkalies (cinchonia, morphia, quinia, strychnia) which have not obtained a place in former editions, and examples for analysis have been added of an instructive character when properly conducted. In regard to the general arrangements, there has been but little alteration, except in classifying the different substances according to their reactions with sulphuretted hydrogen, &c., the order being reversed, commencing with those bodies most easily affected by this reagent, and ending with those exhibiting no peculiar effects, the general effect of the reagent being specified in the heading of each class, and not again repeated under each substance. In addition, there is no division of bodies according to the kingdom from which they are derived, but the organic and inorganic substance follow each other without any definite separation. Other alterations of a minor character are scattered throughout the work, but those above noticed are the most important and sufficient to exhibit the modifications of plan and practice which the author and editor have deemed necessary to make in this publication. This American edition is similar in size and appearance with those formerly issued, and is of a convenient size for consultation and handling.

R. B.

ART. XXXI.—*Clinical Observations on Functional Nervous Disorders.* By C. HANDFIELD JONES, M. B. Cantab.; F. R. C. P., Lond.; F. R. S.; Physician to St. Mary's Hospital. 8vo. pp. 348. Philadelphia: Henry C. Lea. 1867.

THE disorders of which Dr. Jones treats under the denomination "functional nervous," include a very large class of ailments, most of which are of everyday occurrence. Among them will be found a number of which the true patho-

logical character is as yet but imperfectly understood, while their treatment is consequently uncertain, or at best merely tentative. For the proper study of the entire list of "nervous disorders" the author of the present treatise—already favourably known as a careful medical observer—has had ample opportunities, which he has, it must be admitted, faithfully improved. Of his clinical observations and experience, the work before us is, strictly speaking, a faithful record. The points which he esteems to have most bearing on practice, are chiefly the recognition of primary paresis (palsy) of nervous centres, and its distinction from reflex paralysis; the numerous illustrations of vaso-motor nerve disorders; the theory of inhibitory action; the remarkable affinity existing between paralysis, spasm, anæsthesia, and neuralgia; the different quality of nervous disorder, apparently of the same kind in different instances; the intimate relation of neuralgia, in most instances to debility, and the importance of an accurate adjustment of remedies to each individual case of disease.

We most heartily agree with Dr. J. as to the deep interest and importance of the several points above indicated. They are all of them ably exposed by him.

Taken as a whole, the work before us furnishes a short but reliable account of the pathology and treatment of a class of very common but certainly highly obscure disorders. The advanced student will find it a rich mine of valuable facts, while the medical practitioner will derive from it many a suggestive hint to aid him in the diagnosis of "nervous cases," and in determining the true indications for their amelioration or cure. D. F. C.

ART. XXXII.—*A Practical Treatise on Diseases of the Skin.* By J. MOORE NELIGAN, M. D., etc. Fifth American from the second revised and enlarged Dublin edition. By T. W. BELCHER, M. A., M. D., Dub., etc. etc. etc. *Ratione et Experientia.* 12mo. pp. 462. Philadelphia, 1866: H. C. Lea.

THIS edition of Dr. Neligan's well-known treatise has been published since the author's death, under the editorial supervision of Dr. Belcher, a former pupil of the deceased author, and now physician to the Dublin Dispensary for skin diseases. The editor has very faithfully performed his task, having brought up to the present time the account given in the treatise of a most important but little understood class of maladies. It is true, as Dr. B. remarks, that, since the appearance in 1852 of the first edition of Dr. N.'s treatise, "a great change has taken place in the relation of *dermatology* to medicine. Numerous works of value have been published; important discoveries have been made, and papers without number on isolated cases, or classes of skin disease, have continually issued from the medical press. Thus the subject has taken a high professional rank, and has been completely rescued from the shade under which it had fallen, from its having been made a ready means of ill-gotten gain by the quack and the impostor."

To the text of the first edition, which has undergone a careful revision, have been added the discoveries made since its appearance, and the opinions advanced by recognized authorities, as to the causation, nature, and treatment of cutaneous affections; with the result of the experience of the editor whether it particularly confirmed or differed from that of Dr. Neligan.

Considerable additions have been made by Dr. Belcher to the first chapter on classification; chiefly as regards the modern nosologies of Hardy, Hebra, Buchanan, and others. He has also added derivations and meanings of technical terms, with their synonyms. References to Dr. Neligan's *Atlas of Cutaneous Diseases*, as also to the plates of Cazenave and Hebra. References to Macnamara's sixth edition of Dr. Neligan's *Materia Medica*. Quotations from and references to authorities in every case, particularly where the full description of the subject is excluded by reason of the concise method of the work. Explanations of the peculiar modes of treatment, and, in some cases, the prescriptions of the best English and foreign dermatologists. Translations are given throughout of the prescriptions embraced in the work, into the technical language of

the British Pharmacopœia. A *posological* table is added of the most important, and mostly poisonous remedies used in the treatment of cutaneous diseases; together with a copious table of contents, and a bibliographical index of the leading authorities adduced.

Notices of the following, among other cutaneous diseases, occur for the first time in the present edition: namely—rubeola, scarlatina, variola and its allies; furunculus, anthrax, pustula maligna, lepra hebræorum, elephantiasis, morphie, frambœsia, morbus tauricus, Aleppo evil, ngerengere, pellagra, morbus Addisonii.

Considerable additions have been made to the chapter on parasitic diseases, or dermatophytæ, and also to the chapters on diseases of the hair and nails, and to that on therapeutics.

The general index is very full, and comprises the cutaneo-nosological synonyms used by ancient and modern writers in England and other countries. Although the account given in this work of the different cutaneous diseases is a very concise one, a bare outline, it is, nevertheless, very uniformly clear and accurate, furnishing a fair exposition of the present condition of the knowledge and experience of our profession in respect to the pathology and management of these affections. From it the student will gain such preliminary instruction as will enable him to profit by the study of the more extended treatises and monographs on skin diseases that have or may appear, while the practitioner is directed to those sources from whence he may acquire reliable information on these affections, generally, or any one of them which may from any cause at the time claim his attention. D. F. C.

ART. XXXIII.—*Practical Therapeutics, considered chiefly with reference to Articles of the Materia Medica.* By EDWARD JOHN WARING, F. R. C. S., F. L. S., Surgeon in her Majesty's Indian Army. From the second London edition. 8vo. pp. 815. Philadelphia: Lindsay & Blakiston, 1866.

MR. WARING has produced a book which entitles him to the thanks of students, as well as of all who need a work on therapeutics, in which each item is very briefly and authoritatively described. An index of diseases, in which will be found indicated the medicines which have been used or are applicable to each affection named, and also an index of medicines, &c., in addition to the alphabetical arrangement of the whole text, render reference to the volume easy and satisfactory.

The work is divided into an introduction, in which the art of prescribing medicines, their doses at different ages, and under various circumstances, are briefly considered; a first part, in which the articles of the materia medica, alphabetically arranged, are treated of chiefly in reference to their supposed curative properties in an empirical sense, and a second part, in which the therapeutic qualities of classes of medicines, as stimulants, &c., as well as the curative influence of certain remedies, as bathing, electricity, &c., also alphabetically arranged, are discussed.

Mr. Waring's mode of treating each article may be understood from the following extract, selected because it is short:—

"300. APIOL. APIOLUM. A peculiar principle of the seeds of *Petroselinum sativum*, or Common Parsley, obtained by treating them with alcohol at 158° to 176° F. It occurs in the form of a yellowish oily liquid, and with an odour somewhat resembling the powdered seeds, and an acrid, piquant taste. It is soluble in alcohol, ether, and chloroform.

"*Med. Prop. and Action.* Tonic, anti-periodic and emmenagogue. Joret and Homolle found that, when taken in doses of gutt. vij–xv, it occasioned slight cerebral excitement, similar to that produced by coffee, together with epigastric warmth. In doses of ʒss–fʒj, it caused vertigo, tinnitus aurium, headache, &c., similar to the effects produced by a strong dose of Quinine. Occasionally, its use was followed by nausea, colic, and bilious diarrhœa.

"*Dose*, gutt. viij–xv in syrup.

"301. *Therapeutic Uses. In Intermittent Fevers*, the value of Apiol has been examined by Joret and Homolle. Of 43 cases of all types, collected from various parts of France, 37 were cured, and in the remaining 6 the fever was modified, but not removed. Of 30 cases occurring in hot climates, only 16 were cured. From these facts, it is concluded that, if Apiol be not of equal value to Quinine in the intermittents of hot climates, it may yet be very well substituted for it in indigenous, *i. e.*, European, intermittents; other facts in favour of this remedy are adduced by M. Joret. Dr. Jacquot, however, subjected it to a trial in the military hospitals at Rome, and expresses great doubt as to its efficacy, only one case in six yielding completely to the remedy. It apparently deserves to be classed amongst those minor remedies which often prove successful in mild cases of intermittents. The usual dose is gutt. xv, gradually increased. In *Intermittent Neuralgia* and in the *Night Sweats of Phthisis*, Joret and Homolle consider that this remedy is likely to prove serviceable.

"302. *In Amenorrhœa and Dysmenorrhœa.* Apiol, according to Dr. Joret, is one of the safest and best emmenagogues which can be employed, not being contraindicated even in cases of pregnancy. It is thought to be especially adapted for these states when they arise from a diminution or excess or perversion of the vitality of the uterus, attended with local or general nervous symptoms. To be effectual, it requires to be administered at those periods when the menstrual discharge would be naturally expected to return, and to be continued five or six successive days. A dose should be taken night and morning."

Mr. Waring's volume implies very extensive reading and pains-taking industry in its preparation. It seems to be compiled up to the day of publication, and may be regarded to be an excellent summary exposition of what is at present known about the therapeutic properties of medicines. We commend it to the attention of the profession. W. S. W. R.

ART. XXXIV.—*A Manual of Medical Jurisprudence.* By ALFRED SWAINE TAYLOR, M. D., F. R. S., F. R. C. P., and Prof. of Medical Jurisprudence and Chemistry in Guy's Hospital. Sixth American edition from the eighth and revised London edition, with notes and references to American decisions. By CLEMENT B. PENROSE, of the Philadelphia Bar. pp. 776. Philadelphia: Henry C. Lea, 1866.

THIS manual of Professor Taylor's is so well known, and its value so fully appreciated, as shown by its having gone to an eighth edition in England and to a sixth in this country, that it would be a work of supererogation to discuss now its general merits. It will be sufficient at this time to indicate the more important improvements made in the present edition.

For the information and guidance of medical men the author has introduced two chapters on evidence and on the duties and responsibilities of medical witnesses, and also some medico-legal subjects not treated of in previous editions. Numerous engravings representing the crystalline forms of poisons and the apparatus for their detection, have likewise been added.

The American editor has restored some parts omitted by the author in the last London edition, and also introduced from Professor Taylor's other work, *The Principles and Practice of Medical Jurisprudence*, some important articles on noxious animal food, trichiniasis, sexual malformations, insanity as affecting civil responsibility, suicidal mania and suicide, life insurance, &c. He has retained the notes of the former American editor, Dr. E. Hartshorne, and added numerous references to American practice, and decisions thus rendering the American far more comprehensive and valuable than the English edition, and making it a most complete and convenient guide in medico-legal practice.

QUARTERLY SUMMARY

OF THE

IMPROVEMENTS AND DISCOVERIES

IN THE

MEDICAL SCIENCES.

ANATOMY AND PHYSIOLOGY.

1. *Epithelium of Air-Vesicles.*—Dr. C. O. Weber says that there is no doubt of the existence of this epithelium, at least in the fœtus. In a fœtus four months old it may be easily isolated from a pulmonary vesicle in the form of a small spherical mass.—*Gaz. Méd. de Paris*, June 16, 1866, from *Virchow's Archiv.*

2. *Structure of the Kidney.*—M. Chrzonszcewsky combats Henle's ideas on the structure of the kidney. He injects carminate of ammonia into the jugular vein of a rabbit; the carmine passes into the vessels and thence into the uriniferous tubes and the urine. To colour the vessels alone, he ties the renal veins immediately after injecting the jugular, then the artery; to colour the uriniferous tubes only, he ties the ureter and injects through the renal artery a saline solution, which removes all the colouring matter deposited in the vessels of the kidney. The principal results at which he had arrived are the following: The uriniferous tubes end in three ways: in anastomoses, in *culs-de-sac*, and in Malpighian corpuscles. The anastomoses, which are very numerous in man, in the calf, and in the pig, are met with chiefly in the cortical substance. The termination in *cul-de-sac* is very rare; but there is no doubt of its existence. The Malpighian corpuscles (or rather capsules) are continuous with the tortuous tubes alone, and each with only one. The Malpighian capsule is lined with pavement-epithelium; the internal surface of the glomerulus of vessels is also covered with epithelium, but of larger cubic cells, more resembling the tortuous tubes. The Malpighian capsules communicate with the flexuous tubes, and through them with the straight tubes; and all may be injected through the ureter. In the looped canals described by Henle two kinds are to be distinguished: 1. Some described already by Ferrein, found in the peripheral portion of the medullary substance, are merely loops of flexuous tubes burying themselves in this substance. 2. Others, reaching the summits of the pyramids, are merely vessels.—*Gaz. Méd. de Paris*, June 16, 1866, from *Virchow's Archiv.*

3. *Alteration of Organic Structure by Congelation.*—In a paper on the congelation of animals by Dr. Davy, in which the author arrives at the almost self-evident conclusion that perfect congelation is antagonistic to life, he refers to the alteration of structure from the same cause. Muscle, according to Dr. Davy, after having been frozen, showed a well-marked difference under the microscope. When thawed the striated structure was no longer visible, and after a few hours—viz., on the following morning—whilst the unfrozen muscles had undergone no perceptible alteration, those which had been frozen had become of increased tenderness, yielding to a slight rending force, and breaking

short, as if the coherence of the particles forming the fasciculi was greatly diminished.—*Med. Press and Circular*, Nov. 21, 1866.

4. *Myographion.*—Dr. WM. RUTHERFORD, of Edinburgh, gave a description to the British Medical Association of a most ingenious instrument—Du Bois Reymond's Myographion; and performed with it the remarkable experiment devised by Helmholtz to measure the rapidity of nerve-force. He described the instrument as consisting of three principal parts: 1. A glass cylinder turned by clockwork, having a dial by which the rate of the cylinder's revolution may be ascertained with the greatest precision. Before each experiment, the cylinder is smoked, and so permits the point of a stilette to make a tracing upon it. 2. Arrangements for fixing the gastrocnemius and sciatic nerve of a frog, and for connecting the muscle with the stilette. The femoral extremity of the muscle is secured by a pair of forceps; and the tendo-Achillis is connected by hooks with a movable beam, having at its one extremity a stilette. When the muscle contracts, the beam is raised; and the stilette, being in contact with the cylinder, produces a tracing corresponding to the contraction of the muscle. The muscle and nerve are surrounded by a glass case containing wet blotting-paper, to prevent the tissues from becoming dry. 3. Arrangements by which the nerve is irritated, and the muscle thereby thrown into action at a given point of time. The nerve is irritated by breaking a constant electrical current sent through it. Two pairs of wires are placed in contact with the nerve; one pair as near the entrance of the nerve into the muscle as possible, and the other at a point of nerve about two inches from the muscle. The wires are connected with a simple contrivance called an inverter, by means of which the current from a battery and galvanic machine can be sent through one pair of wires in contact with the nerve or the other; the object of the experiment being to ascertain how long the nerve-force takes to pass from the point of nerve over the one pair of wires to that over the other. The part of the instrument by which the electrical current is broken, and irritation of the nerve thereby produced at a given moment, consists of a round brass box, fixed to the axle of the cylinder, and rotating with it. The box contains a movable weight; and as it revolves, the weight, from centrifugal force, moves outwards; and, when it had reached a certain point, it suddenly breaks the electric circuit, and so throws the muscle into action. By means of the dial upon the clockwork, the rate of the cylinder's revolution, just when the current is broken, can be accurately ascertained; and, by means of a spiral spring attached to the weight in the brass box, the rapidity with which the weight moves outwards may be regulated, and so we can have the current broken when the cylinder revolves ten times or fifteen times in a second, and so on.

The experiment was begun by counting the velocity of the cylinder when the current was broken. It was found to be exactly fifteen revolutions in a second; the circumference of the cylinder being six inches—$6 \times 15 = 90$ inches linear of surface of cylinder—equal to a second of time. The cylinder was then blackened by means of turpentine smoke. The gastrocnemius and sciatic nerve of a frog were dissected out and attached in the manner above indicated; the electrical current was sent through the nerve close to the muscle, and the clockwork set in motion. When contraction had taken place, the instrument was stopped and re-arranged; the current was then sent through the portion of nerve two inches from the muscle, and the clockwork again set in motion, and stopped when the muscle had contracted. The cylinder was then rolled along a moistened sheet of gelatine, and an impression taken from it. It was then found that the commencement of the tracing produced after irritating the nerve two inches from the muscle was one-fifth of an inch distant horizontally from the commencement of that which had followed irritation of the nerve near the muscle. The nerve-force had taken an interval of time equivalent to the one-fifth of an inch of the cylinder's surface to pass from the point of nerve over the one pair of wires to that over the other; that distance was two inches. The next point was to find the value in time of the one-fifth of an inch. Ninety inches of the cylinder's surface corresponding to one second, one-fifth of an inch would, of course, be equivalent to 1-450th of a second. If it took 1-450th of a

second to travel two inches, how long would it take to travel a foot? By simple proportion, it was found to be 1-75th of a second, which is, of course, equal to seventy-five feet per second. This is the usual rate in the frog.

The myographion of Du Bois Reymond is similar to that constructed by Helmholtz; the essential difference consisting in the arrangements for breaking the current at a given moment of time. In Du Bois Reymond's, this is effected with greater simplicity and precision.—*British Med. Journ.*, Aug. 25, 1866.

MATERIA MEDICA AND GENERAL THERAPEUTICS.

5. *Chlorate of Quinia.*—This newly-discovered salt (see No. of this Journal for July, 1866, p. 232), which the profession owes to Dr. Lyons, continues to be employed in his Clinique and in his private practice, we are informed, with most satisfactory results. In cases of scarlatina, typhus, all low pyrexial states, local inflammations, &c., the use of this drug is indicated, and so far as opportunities have yet been afforded for testing its efficacy, the results are reported to be highly favourable. From its chemical constitution and the large amount of available oxygen which is thrown into the system when this medicine is ordered, according to the formula recently furnished,[1] in solution with perchloric acid, valuable therapeutic effects may be anticipated *a priori*. The tonic alkaloid conveyed into the economy at the same time is a very important substitute for the potash in the ordinary salt hitherto employed (chlorate of potash). Dr. Lyons awaits an opportunity of testing the value of the chlorate of quinia in that malady in which, above all others, chlorate of potash has attained, according to Trousseau and Pidoux, its most important and indisputable triumph—namely, gangrenous stomatitis. Meanwhile he invites the co-operation of his professional brethren in testing the value of this hitherto unused salt.—*Medical Press and Circular*, June 20, 1866.

6. *Syrup of the Phosphates of Iron, Quinia and Strychnia.*—Dr. Lyons has for some time past employed with, he conceives, very important therapeutic results, this powerful tonic combination, for which the profession is mainly indebted to the late Dr. Eaton, of Glasgow, and Professor Aitken, of the Royal Victoria Hospital, Netley.

The concentrated syrup of the phosphates, when made by double decomposition, according to Professor Aitken's formula, contains per drachm two grains of the phosphate of iron, one grain of the phosphate of quinia, and one thirty-second of a grain of the phosphate of strychnia. It is a perfectly clear and limpid fluid, slightly refracting light with the peculiar tint of the quinia solutions, and viewed in mass, obliquely showing the bluish tint of the phosphate of iron held in solution. It is perfectly miscible with distilled water, has a strong styptic and distinctly chalybeate taste, and an aftertaste of quinia. It may be exhibited in doses of twenty to forty, and even sixty, minims, diluted with water, according to age and the circumstances of the case. It is well borne in the majority of cases; it acts as an invigorating stomachic and sensibly improves appetite; it is an admirable general tonic; it appears to be a readily assimilable chalybeate, and is thus well adapted for certain chlorotic and anæmic states. In the morbid states of the nervous system which precede and accompany the development of the strumous diathesis, the influence of the strychnia salt appears to be exercised with great potency as a nervine tonic and stimulant, and it would seem to be an important agent in altering the morbid state of the nervous apparatus which presides over the function of nutrient assimilation. Physiologically, this influence may be supposed to be attributable to the well-known action of the strychnia salts on the spinal cord, as well as by direct stimulus to the filaments of the great sympathetic plexuses distributed

[1] See this Journal, July, 1866, p. 232.

to the stomach and intestines. From the general tonic and invigorating effect of this drug, its influence on the stomach and the promotion of appetite, as well as by the improved assimilation of food which it induces, it is a very valuable medicine in cases of strumous children threatened with scrofulous degeneration and ultimately with localized tubercular development. As a preparative to the use of cod-liver oil, and in certain cases as a concomitant to this food-substitute, the syrup of the three phosphates will be found a very important adjunct in the treatment of numerous forms of strumous disease.

But the employment of this admirable combination is not limited to the cases just mentioned. In depressed states of the system in the adult and the aged, in several of the conditions tending to adipose degeneration of important organs, such as the heart and kidneys, the syrup of the phosphates will be found a serviceable and reliable remedy. Where it is desired to combine a tonic and styptic to aid in checking the drain of albumen from the system in chronic disease of the kidneys, this combination will be found of great use.

In many forms of cutaneous diseases where a tonic effect is desired, this combination will be employed with benefit.

For the use of strychnia in chorea and certain other of the maladies of children, the high authority of Trousseau and Pidoux may be cited. These distinguished authors give the following formula for the preparation of a syrup of strychnia. Five centigrammes of the sulphate of strychnia are dissolved in one hundred grammes of simple syrup. One hundred grammes contain about twenty-five *cuillerées a café* or teaspoonful; each teaspoonful or drachm contains two milligrammes or one twenty-fifth of a grain of the sulphate of strychnia. Dr. Lyons is of opinion that a superior efficacy will be found to attach to the triple combination above described. His best thanks are tendered to the Army Medical authorities in this city, by whose kindness Sergeant Moss of the Army Medical Stores, himself an experienced practical chemist, and who had learned the process under Dr. Aitken's supervision, has been allowed to prepare for him a specimen of the syrup of the phosphates of iron, quinia, and strychnia in exact accordance with Professor Aitken's directions.—*Medical Press and Circular*, June 20, 1866.

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7. *Jurubeba* (*Solanum Paniculatum*).—A naturalist of Pernambuco has made some experiments with this plant, and found it to possess such extraordinary properties that he thinks it would be useful to introduce the plant into European practice; and already at Pernambuco a plaster, a powder, a syrup, a wine, a tincture, a watery and alcoholic extract, an electuary, and an oil are prepared with this substance, which is employed in all cases of intermittent fevers, liver complaint, splenic affections, catarrh of the bladder, anæmia, chlorosis, dropsy, and difficult menstruation: and it is said to be the most energetic tonic and deobstruent in the materia medica. The jurubeba will be presented to commerce in the forms of leaves, fruits, and roots. The bark of the root and the leaves have a well-marked bitter taste. The root, when treated with water or alcohol, furnishes a bitter extract, which is more abundant in the cortical than in the woody part of the root.—*British and Foreign Medico-Chirurgical Review*, Oct. 1866, from *Bulletin Général de Thérapeutique*, Jan. 15, 1866.

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8. *Therapeutical Uses of Narceina.*—The sleep produced by narceina differs, according to M. Bernard, from that of morphia by its tranquillity and the absence of snoring, as well as by the waking which follows its use; neither paralysis nor disturbance of the intellect is observed such as always follows the torpor of morphia, and animals return much more quickly to their normal state than after the use of morphia. The publication of the above views by M. Bernard induced M. EULENBURG to make frequent use of narceina, especially in surgical cases, and even on persons in health. It may be used either internally or externally. The last method, by subcutaneous injection, has been proved to be preferable by the certainty of the effects produced and by the smallness of the doses required. M. Eulenburg employs for this purpose a solution of hydrochlorate of narceina, containing from the eighth to the fourth of a grain; but for internal use he employs from the sixth to the half of a grain. In healthy per-

sons these doses have been generally followed by a slight narcotic effect, without headache or gastric derangement. Among the physiological effects of narceina, in addition to narcotism, is its action on the circulation, consisting in a diminution of the pulse, succeeded by acceleration. M. Eulenburg considers it superior to all other substances in its sedative and hypnotic effects, and that its employment is indicated in articular affections, phlegmons, lesions of the eye (as iritis), orchitis, cystitis, and after painful operations. In all such cases, when given in the above-mentioned doses, either internally or externally, it rapidly relieves pain and produces a gentle sleep. Among the cases published by M. Eulenburg there were several in which morphia produced only a negative or insufficient result, in consequence of want of tolerance or of some other cause, and in which narceina acted in a most satisfactory manner. He has hitherto had but few opportunities of employing narceina in neuralgia; but when he has done so, rapid improvement has followed its use.—*Ibid.*, from *Bulletin Général de Thérapeutique*, May 30, 1865.

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9. *Influence of Alcohol on the Temperature of Non-febrile and Febrile Persons.*—Drs. Sydney Ringer and Walter Rickards in a paper read before the Royal Med. and Chirurgical Society (June 26), gave the results of some observations on the influence of alcohol on the temperature of non-febrile and febrile persons, and a few on rabbits. The authors gave alcohol in poisonous doses to three non-febrile adults. The temperature was greatly depressed in two. The depression amounted to 3° Fahr. In the third case the temperature was but little influenced. The subject of this observation was a confirmed drunkard. He confessed to getting drunk whenever he had the opportunity. Alcohol was also injected into the rectum of two rabbits. In both the temperature was considerably depressed. The depression amounted to 15° Fahr. The authors, therefore, concluded that alcohol in poisonous doses causes a very considerable depression of the temperature of the body of non-febrile persons, and also that it is probable that habit obviates this effect. Further proof in favour of this latter conclusion is given in a subsequent part of the paper. The rapidity of the fall of the temperature after death of two patients and one rabbit was ascertained. This is compared with the rapidity of the fall of the temperature after the use of alcohol. It was found that the temperature falls as rapidly after the use of alcohol in poisonous doses as after death. The circumstances determining the cooling of the body, however, differ in the two conditions. Thus during life much heat is carried off by the air inspired into the lungs. Assuming that the cooling effects of respiration are equal to those that result from radiation from the surface of the body, it follows that alcohol possesses the power to diminish by one-half those processes that produce the heat of the body. Both of the patients whose temperature was depressed suffered from nausea and vomiting. In order to ascertain if the depression of the temperature were due to the conditions that accompany vomiting, tartar emetic was given to a patient every ten minutes, and continued long after vomiting was produced. The administration of the antimony was continued seven hours. No depression of the temperature resulted. Thus the authors conclude that the depression of the temperature was not due to the vomiting produced by the alcohol. Alcohol was next given, in ordinary doses, to non-febrile persons. Eleven observations were made. In eight the temperature was depressed. In three cases the temperature was unaffected. These three persons were strong adults. The quantity of alcohol given them was small (an ounce of brandy). Two of them were confessed free drinkers. The amount of depression was slight. The authors thus conclude that alcohol, when taken in ordinary quantities by non-febrile persons, causes a slight depression of the temperature of the body, but that the amount of depression which occurs is too slight to contraindicate its use. Numerous observations were made to ascertain the influence of alcohol on the temperature of febrile persons. To some of the patients very large quantities of alcohol were given. To a child of 12 years old eleven ounces of absolute alcohol were given on one day. From these observations the concluclusion is drawn that ordinary and extraordinary quantities of alcohol cause only a slight and temporary depression of the temperature of febrile persons,

and consequently alcohol cannot bring the temperature of febrile patients to that of health. But if alcohol should be indicated by the general condition of the patient, it will, also, to some extent act beneficially in virtue of its power to cause some diminution of the temperature of the body.

Some observations were made to ascertain the influence of alcohol on the pulse. From these the conclusion is drawn that alcohol increases the force of the pulse, but lessens its frequency.

In conducting these observations the following precautions were taken: the patients were kept in bed: all the conditions were kept the same; the thermometer was kept the whole time in the axilla, and the temperature was noted every few minutes. The observations were continued many hours—in some cases during the entire day.—*Med. Times and Gaz.*, Sept. 29th, 1866.

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10. *Application of Carbonic Acid in the Treatment of Diseases of the Urinary Passages.*—M. DÉMARQUAY discusses in a recent work by him on pneumatology the advantage of the exhibition of carbonic acid in diseases of the genito-urinary organs. This gas was employed in the last century chiefly as a solvent of calculi, but it is probable that the beneficial effects observed were due rather to the soda or potash employed in the process of extricating carbonic acid than to the carbonic acid itself. But a more useful and practical application of the medicinal properties of carbonic acid has been made in certain cases of cystitis and vesical neuralgia. Last summer M. Démarquay witnessed a case of vesical neuralgia occurring, without any apparent cause, in a woman aged thirty, and giving rise every day to numerous paroxysms of five or ten minutes' duration. Injections of carbonic acid repeated twice a day induced rapid improvement, so that after four days three paroxysms only occurred in the twenty-four hours, and a cure, but perhaps a temporary one, was effected in a fortnight. In such cases the carbonic acid acts as a special sedative. The vesical douche may be easily administered with a small caoutchouc bag filled with carbonic acid, which is propelled into the bladder through a common catheter. But another and more complicated system exists in the use of an apparatus, known as Mondollot's, and consisting of a double-barrelled tube, which facilitates the escape of any gas in excess from the bladder. The probable utility of carbonic acid as a sedative in some uterine affections characterized by local irritation might be inferred from its known physiological effects. Thus it has been successfully employed in the form of fumigations in amenorrhœa and dysmenorrhœa, and M. Démarquay thinks that in such cases water charged with carbonic acid might be a good substitute for the gas itself. Among the various uterine affections in which M. Démarquay has derived benefit from the carbonic acid douche are chronic enlargements and simple ulceration of the cervix; and the same remedy has succeeded in allaying pain, in checking fetid secretions, and occasionally in healing ulcers. M. Démarquay, however, does not regard carbonic acid as a panacea in the above-mentioned complaints, but thinks it may be of considerable service in certain cases.—*British and Foreign Medico-Chirurgical Review*, Oct. 1866, from *Journal de Médecine et de Chirurgie Pratiques*, Oct. 1865.

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11. *Therapeutical Application of the Permanganate of Potash.*—Dr. COSMAO-DUMENEZ, of Finisterre, remarks, in the first place, that disinfectants act in three different ways: namely, by preventing the formation of fetid gases, by absorbing them, or by decomposing them; and as permanganate of potash acts in the last-named manner, it holds the first rank, and it is the more valuable as it is itself insipid and inodorous. This substance may be used either in solution or in powder mixed with carbonate of lime or starch, but Dr. Dumenez prefers the solution. He has treated many cases of ulcerated legs, exhaling a fetid smell and presenting a grayish appearance, and two or three dressings with the permanganate were sufficient to remove entirely the bad smell and to restore a roseate colour to the affected tissues. The permanganate, therefore, promotes the cicatrization of wounds, and Dr. Dumenez has often seen this effect to follow its use. The odour from gangrenous wounds disappears with surprising rapidity under the use of the permanganate; and even in cases of cancerous ulceration of the uterus, the use of injections of this salt improves the general

state of the patients by putting them into a better hygienic condition. Ulcerated cancer in other regions may be treated with similar success by lotions or injections. In ozæna and in fetor of the breath the permanganate has been found very useful, and Dr. Dumenez quotes from Dr. Oliffe a case of ozæna thus successfully treated. In the case of morbid secretions it appears to remove from these liquids their septic character, and thus to improve the condition of wounds from which they may emanate. It never produces any bad effect, and when applied on mucous membranes, whatever the dose may be, it produces no pain or irritation. Dr. Dumenez passes in review the various substances which have from time to time been employed as disinfectants, such as acids, chlorine, and the chlorides, pyrogenic oils like that of coal-tar, &c., and he gives the preference to the permanganate of potash over them all.—*British and Foreign Medico-Chirurgical Review*, Oct. 1866, from *Bull. Gén. de Thérap.*, Nov. 30, 1865.

MEDICAL PATHOLOGY AND THERAPEUTICS, AND PRACTICAL MEDICINE.

12. *Digitalis in the Treatment of Mania, Recent and Chronic.*—Dr. S. W. D. Williams, in a paper with nineteen illustrative cases, published in the *Journal of Mental Science* (January, 1866), confirms the opinion of Dr. Robertson as to the efficacy of digitalis in certain forms of mania. The cases already published by Dr. Robertson tend to show the almost specific action of digitalis in allaying the excitement of impending general paresis; but the paper of Dr. Williams is confined to illustrating the use of the drug in the excitement accompanying mania in its acute and chronic forms, and also when complicated with epilepsy. The results of the cases show that digitalis seems to possess a marked power of arresting cerebral excitement, of whatever nature it may be; but it is also evident that, except as allaying excitement it has no further curative powers. Dr. Williams considers its efficacy in chronic mania and epilepsy to be simply due to the fact that it lessens the action of the heart, thus diminishing the flow of blood to the brain, and offering less food for the excitement to feed on. This view is rendered more probable from the fact that digitalis never exerts any beneficial influence until after the pulse has been affected; and Dr. Williams has moreover observed that when the system has become used to the potency of the drug, the return of the pulse to its former rate is accompanied by a corresponding exacerbation of excitement, which can only be allayed by increasing the dose. Although it might be supposed that only strong, healthy constitutions would be able to bear the effects of digitalis, this view is incorrect, for patients weakened by disease or exhausted by excitement bear its administration in general better than those who are stronger; and this fact explains its efficacy in general paresis, which is essentially a disease of debility. Dr. Robertson advises the use of doses varying from ʒss to ʒj three or four times a day, under which treatment an excited patient may perhaps at first become more excited than before; but if the medicine is continued, it will be found that the excitement gradually subsides, and the pulse becomes intermittent. When this is the case, the digitalis should be omitted until the pulse has resumed its normal rhythm. As regards epileptics, Dr. Williams thinks that digitalis possesses a certain amount of preventive power, and is able not only to ward off the attacks of violence, but to lessen their force when they occur. One of the patients whose case is recorded by Dr. Williams had taken ʒss of digitalis (tincture) twice daily for many months and with marked benefit, for one of the epileptic relapses passed off without the slightest manifestation of violence. In some cases where digitalis has after a time lost its power, or has caused sickness and vomiting, Dr. Robertson combines it with morphia, tincture of hyoscyamus, and chloric ether. The influence of digitalis on the heart being generally admitted, the question is whether it is a stimulant or depressant; and Dr. Williams inclines to the belief that it is a decided stimulant. The general conclusions drawn by Dr. Williams

as to the use of digitalis in insanity are that it is a valuable sedative both in recent and chronic mania, and when these forms of disease are complicated with general paresis and with epilepsy; that the average dose of the tincture is ʒss to ʒj, to be continued even for many months, unless it causes intermittence of the pulse, when it must be immediately discontinued; that weakness of the circulation is no indication against its employment, but the reverse; and that in certain cases it may be advantageously combined with chloric ether, morphia, and prussic acid.

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13. *Capsicum in Delirium Tremens.*—Since our last notice [see this Journal for July, 1866, p. 241] of the employment of this simple and efficacious plan of treatment, some well-marked cases have occurred in Dr. LYONS's practice. In one instance, the patient, a tavern-waiter, of chronically intemperate habits, was admitted to the Whitworth Hospital in the first stage of this morbid condition. The patient exhibited tremor in almost all the muscles of the body, chilliness, debility, sleeplessness, foul tongue, severe and general uneasiness, but there was a total absence of illusions, horrors, or delirium to any degree. He got a single dose of capsicum, twenty grains in a bolus, after which he slept and fully convalesced, the disease having been thus peremptorily cut short. Dr. Lyons remarks on the great importance of this early phase of the disease being recognized and promptly treated. The patient is in that condition in which he may be by but slight further indiscretion plunged suddenly into all the horrors and moral degradation of the state of fully developed delirium tremens, with all its consequent loss of character with others, and loss to the patient himself of that last barrier against utter abandonment, the sense of shame and remorse. For not alone does the first occurrence of delirium tremens brand the sufferer with the character of an all but irretrievable dipsomaniac, but the fact that he has passed this moral Rubicon, in the vast majority of cases deprives the patient of all stimulus to self-control, and under the demoralizing feeling that there is nothing further to be risked, his steps henceforward ever tend downwards and from bad lead on to worse.

As Dr. Lyons observes, a brief but variable period often precedes the fully developed attack of delirium tremens, especially in first cases, in which the patient presents anomalous symptoms unintelligible to himself, and not always read aright by his attendant. This stage is in some patients marked by the occurrence of tremor, sleeplessness, and general distress and anxiety, without a trace of delirium. In other instances slight illusions prevail without tremor, from which the patient can by an effort arouse himself, and under strong self-directed exertion of the will even command his faculties for a time, and pursue avocations of business, to break down, it may be, hopelessly, a few hours subsequently, if his condition is neglected, misunderstood, or mistreated. Under these circumstances, the treatment by capsicum comes in very opportunely, and by its employment we may, as in the case just cited, cut short the disease, and so save the patient from the consequences of his imprudence, and possibly restore him to a reformed life. Another case well illustrates the success of this drug when opium had completely failed to alleviate the symptoms, and seemed on the contrary in many respects to aggravate the patient's condition. The case was that of an individual who had taken six grains of opium within a period of two or three days without sleep being procured, or any relief to the illusions, tremor, and distress under which the patient laboured. After a twenty-grain dose of capsicum in bolus, profound and refreshing sleep for twelve hours was induced, and the patient awoke conscious and restored. In an almost precisely similar instance occurring about the same period a thirty-grain dose of the drug had to be given a second time before full relief was procured. In one or two instances of individuals of confirmed and extremely intemperate habits it was found necessary to repeat the dose some three or four times.

As to the physiological action of the remedy, Dr. Lyons's explanation is that already given in a former communication—namely, that it produces a powerful stimulant and sedative influence by its direct action on the gastric filaments of the vagi. Slight uneasiness in the stomach has been complained of in one in-

stance only after its use, and in two instances somewhat smart purgation was noticed, but without any evidence of intestinal or other irritation.

As at present employed, the drug is administered in bolus made up with honey of roses; but Dr. Lyons suggests the feasibility of its being conveyed to the stomach in the more agreeable form of a capsule.

As capsicum belongs to the great order of the Solanaceæ, Dr. Lyons suggests the possibility of its containing a narcotic principle hitherto undiscovered. He has referred this question for further elucidation to his distinguished friend, Mons. Gages, curator of the Museum of Irish Industry, a chemist of great eminence.—*Medical Press and Circular*, June 20, 1866.

14. *Digitalis in Large Doses in the Treatment of Pneumonia.* By Dr. Gallard.—Among the numerous remedies which have been proposed and are now employed in the treatment of pneumonia, digitalis appears to be particularly indicated in cases where the febrile reaction seems to require the employment of antiphlogistics; but where the debility of the patient, and especially the state of depression into which he has fallen from the commencement of the disease would appear, on the other hand, to require the use of stimulants and tonics. These cases are not rare in practice, and they correspond pretty accurately to the form of pulmonary inflammation described under the name of *typhoid pneumonia*, and it is in such that Dr. Gallard has found digitalis most beneficial. He relates a case of a young man treated at the Hôpital de la Pitié with success by the use of digitalis. This drug, however, was not employed alone; but Dr. Gallard calls attention to the fact that the previous treatment by blistering and tartarized antimony produced no effect, and was discontinued because the patient was unable to bear it, owing to his weakness and depression. The digitalis was given in powders, each containing five centigrammes, to be taken every two hours. In twenty-four hours the pulse was reduced twenty beats, and in forty-eight hours forty-eight beats, having been originally one hundred and eight, and being reduced to sixty. The improvement in the local symptoms soon followed that of the general symptoms, and the patient, who was considered unable to resist an energetic antiphlogistic treatment, recovered in less than a week from a most alarming attack.—*British and Foreign Medico-Chirurgical Review*, Oct. 1866, from *Bulletin Général de Thérapeutique*, March 30, 1866.

15. *Treatment of Unabsorbed Pneumonic Deposits.*—Dr. Andrew Clark, in a paper read before the Medical Society of London (Oct. 15, 1866), began by defining the conditions of which he spoke, and showed that, though not uncommon, they were often overlooked. He then proceeded to discuss the signs and symptoms by which the presence of these deposits was to be recognized, and the difficulties incident to a correct diagnosis. The destiny of the deposits was next passed in review: he said they were absorbed; or they became contracted, hard, and tantamount to lumps of yellow tubercle; or they broke up into cavities, the case being then clinically undistinguishable from ordinary phthisis; or they issued in rare cases in the development of cancerous disease. Dr. Clark next told the history of thirteen cases which had been purposely left without treatment, in order to illustrate the natural history of the deposits, and show the relative proportions in which they became absorbed, indurated, or broken up into cavities. In these thirteen cases the deposits disappeared within five months in four; remained little altered at the end of two years in six; and went on to softening and fatal destruction of lung within little more than a year in three. The author then considered the conditions which hastened or hindered recovery, and pointed out their bearing upon treatment. He next discussed whether, above this natural treatment, art possessed other resources by which the number of recoveries might be increased and that of untoward issues diminished; and he said that he was able by his experiments to answer the question in the affirmative. His experiments were conducted exclusively on men, and all were placed as nearly as possible under the same hygienic rules. The objects of these rules were to raise the general health to its highest point, to promote the thorough moulting of the textures, and to foster the physiological conditions favourable to active absorption and excretion. The patients were ordered

to sponge every evening with tepid water; to take daily three substantial meals, in which meat, bread, milk, and eggs formed the leading constituents; to consume in the course of the day from three to four pints of fluid, of which one should be malt; to have plenty of out-door exercise, fresh air, and recreation; to exercise the lungs frequently by means of deep inspirations; to clothe warmly; to avoid hot crowded rooms, damp places, draughts of cold air, and worry of every kind. With these directions, common to all, the cases were treated on three different plans—the mercurial, the acid tonic, and the alkaline tonic. The mercurial plan consisted of counter-irritation and bringing the patient slowly under the influence of mercury by means of gray powder and ipecacuan; the acid tonic plan in giving quinia, or quinia and iron, with acids; the alkaline tonic plan, first, in the administration of bark, iodide of potassium, bicarbonate of potassium, and ammonia till the urine became alkaline, when this mixture was replaced by five-drop doses of the arseniate of soda; and second, in the inhalation twice a day of sprays of weak solutions of bicarbonate, chlorate, or nitrate of potash. When there was irritability of stomach bromide of potassium replaced the iodide; and when there was anæmia calumba or quassia was substituted for bark, and five to ten grains of citrate of iron added to each dose. The author then contrasted the statistical results of the thirteen cases left to themselves with sixteen cases treated on the mercurial plan, seventeen on the tonic, and nineteen on the alkaline, and drew from them the following among other conclusions: "That art might be made of real service to nature in the recovery of these cases; that the mercurial plan was by far the worst, and the alkaline plan decidedly the best, method of treating them. The author explained the reserve with which we should adopt rules of treatment based upon mere statistical returns, and pointed out how important an element in the confirmation of their accuracy was the moral conviction of the practitioner begotten by multitudes of impressions, and growing up through multitudes of corrections and limitations. He concluded by saying that, as art had proved to be of real help to nature in the removal of pneumonic deposits, it was our duty, so long as the extent to which that help might go remained uncertain, to endeavour to determine it by therapeutical experiment.

In the discussion which ensued, Dr. Palfrey, Dr. Camps, Dr. Symes Thompson, Dr. Sansom, Dr. Broadbent, Mr. Hinton, Dr. Routh, Mr. Barnes, and Dr. Hare took part. It was generally considered that the statistics of cases adduced by Dr. Clark were conclusive in showing that pneumonic phthisis was not so formidable and fatal a disease as had been formerly supposed, and that the system of supporting the patient was that indicated.—*Lancet*, Oct. 20, 1866.

16. *Detection of Lung-tissue in the Expectoration of Persons affected with Phthisis.*—Dr. SAMUEL FENWICK read a paper on this subject before the Royal Medical and Chirurgical Society (June 26), in which he gives the results obtained from the examination by the microscope of the expectoration of 100 real or suspected cases of phthisis. The plan hitherto recommended of searching for pulmonary tissue in sputum has been to spread it on a flat surface, and to pick out of it with needles any portions that might appear likely to contain elastic fibre. He has, on the contrary, been in the habit of liquefying the expectoration by boiling it with a solution of pure soda, and then placing the fluid in a conical shaped glass, when every particle of elastic tissue falls to the bottom, and can be removed and placed under the microscope, as is done in the examination of urinary deposits. In this way he has easily found $\frac{1}{1000}$ part of a grain of pulmonary structure after it had been mixed in bronchial mucus; and he calculates that $\frac{1}{10000}$ to $\frac{1}{60000}$ part of a grain may be detected in any expectoration that may contain it. In 13 out of 23 cases in which tubercle was suspected to be in the first stage, lung-tissue was found in the sputum. In 7 of the 23 cases, there was no physical sign of tubercle, but its existence in the lung was suspected from general symptoms only; and in the expectoration from these there was no pulmonary tissue. In 16 cases there were stethoscopic signs leading to the belief that tubercle was present; and in 13 of them elastic fibre was found in the mucus coughed up. There were 24 cases in which auscultation and percussion indicated softening of tubercle in the lungs, and in all pulmonary tissue

was present in the sputa. In 15 the physical signs were of a doubtful nature, and 7 of these presented microscopic evidence of ulceration of the lungs. In 35 cases the stethoscope indicated cavities, and in all these there were fragments of lung-tissue in the expectoration. In 2 cases the author had diagnosed enlarged bronchial tubes, and in neither of them was there any appearance of elastic fibre in the sputum. In 69 cases he counted the numbers and size of the fragments of lung expelled. In one specimen, coughed up in twelve hours, 800 fragments were found; and often 50 or 60 fragments were detected, where, from the stethoscopic signs alone, no great destruction of lung could have been anticipated. The proportion of bronchial tubes the author found to be least in the stage of softening, and greatest where the stethoscope indicated cavities. The greatest proportion of fragments of single air-cells was found in the first stage, and the largest proportion of large fragments of lung where cavities existed. The author concluded his paper by giving a number of practical directions as to the best method of conducting the examination of the expectoration, in order to find with quickness and certainty and pulmonary tissue that may be present.—*Med. Times and Gaz.*, Sept. 29th, 1866.

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17. *Consumption treated with Pancreatic Emulsion of Solid Fat.*—Dr. Horace Dobell reports (*Lancet*, Nov. 17, 1866) the results of 187 carefully watched cases, and the sum of the whole series, which has extended over about three years, is as follows:—

In the first stage (advanced), 45 cases; second stage, 69; third stage, 73. Condition on discharge measured by general symptoms: Improved, 158; stationary, 8; worse, 18; not noted, 3. Measured by physical signs: Improved, 118; stationary, 46; worse, 18; not noted, 5.

Emulsion agreed, 180; disagreed, 7.

Cod-liver oil agreed, 75; disagreed, 98; not tried, 14.

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18. *Hydatid of the Liver, treated successfully by the Injection of the Extract of Male Fern into the Cyst.*—Dr. F. W. Pavy communicated the following case of this to the Royal Med. and Chirurgical Society, (June 26). Harriet V., a woman of pretty healthy appearance, aged twenty-one, admitted into Mary Ward under the care of Dr. Pavy, October 4, 1865. When three years old she was squeezd against a wall by a cart wheel, which struck her somewhere on the right side of the chest. No rib was fractured, and she soon recovered from the accident. About six years ago the patient noticed a slight swelling in her right side, which has since continued gradually increasing in size. On examination, a large deep-seated tumour was to be noticed occupying the right hypochondriac region, and extending considerably beyond, both above and below. Its boundary could be clearly defined inferiorly. It caused a considerable bulging of the ribs on the right side, and the right mammary gland was raised about three-quarters of an inch above the level of the left. Fluctuation was apparent. Dulness extended as high as the lower border of the second rib on the right side. The case was diagnosed to be one of hydatid tumour of the liver. The relationship that is agreed upon by helminthologists to exists between the hydatid and the tænia, and the known effect of the extract of male fern upon the latter, suggested to the author the treatment adopted. The extract is not miscible with alcohol or water, but it was ascertained that a liquid sufficiently thin for passing through a fine canula was to be obtained by admixture with a little potash. November 6th.—A fine trocar and canula were introduced into the tumour by Mr. Durham, and about four ounces of a limpid colourless fluid allowed to escape, in order to diminish the tension of the cyst. A liquid consisting of half a drachm (by measure) of the purified semi-fluid extract of male fern, half a drachm of liquor potassæ, and six drachms of water, was then injected into the sac, care being taken throughout to prevent the entrance of air. The fluid removed was examined, and found to be non-albuminous, charged with a large quantity of the chloride of sodium, and to contain hooklets of the echinococcus. At the introduction of the trocar the patient complained of experiencing a considerable amount of pain, which she referred to the lower part of the abdomen. Some febrile excitement, vomiting, and purging followed, but there

was no evidence of peritonitis. 10th.—On percussion, it was found that dulness did not extend so high in the chest on the right side by one rib as previous to the operation. 16th.—The patient was allowed to get up. 20th.—The tumour was found to be much diminished in size. It was much softer, did not extend so low down in the abdomen, and was much less distinctly circumscribed. The chest was resonant on percussion as low as the space between the fourth and fifth ribs. 29th.—The circumference over the most projecting part of the tumour before the operation was 34¼ inches; to-day it is 31¾ inches, showing a reduction of 2½ inches. Tumour very soft, and its lower border not to be defined as formerly. The patient, being well, was allowed to leave the hospital. A fortnight and again a month afterwards she was seen, and found to be progressing satisfactorily. May 10, 1866.—Since she was last seen the patient had suffered from an attack of rheumatic fever with heart complication and bronchitis. She had been in no way troubled with her side, and her circumference now was 30 inches. No swelling was perceptible to the eye, but a hardness remained in the hypochondriac region. The inference to be drawn from the result in this case is, that the injection of the extract of male fern caused an immediate destruction of the life of the hydatid without the production of suppuration, and that a rapid absorption of the fluid element of the cyst afterwards took place. —*Med. Times and Gaz.*, Sept. 29th, 1866.

19. *Elimination in Cholera.*—Prof. LIONEL BEALE discusses ably in two articles in the *Med. Times and Gazette* (Sept. 29 and Oct. 6, 1866,) the doctrine of elimination in cholera and briefly states the principal conclusions at which he has arrived as follows:—

1. That the gland-cell is not, as a general rule, destroyed when it secretes.
2. That the poisons "eliminated" by the skin and kidneys are probably in a state of solution.
3. That the poisons of contagious diseases are not soluble, but consist of living germs which move of themselves, but which cannot be "eliminated" from the blood by epithelial or other cells.
4. That so far from there being any evidence of the epithelial cells eliminating contagious poisons, the living particles of the latter interfere with the action of the cells, and many cells are destroyed by them.
5. That the function of the columnar epithelial cells is to draw substances from the intestine and pass them on towards the blood, and that therefore it is most improbable that these cells should take part in "eliminating" anything whatever from the blood.

[If these conclusions be just—and we believe them to be so—they are fatal to Professor Johnson's theory of cholera.]

20. *Treatment of Rheumatism.*—In a discussion at the recent meeting of the British Medical Association, brought on by a paper on this subject, Professor BENNETT said that he understood the paper now read to advocate the good effects of quinia; and he should like to hear that brought out. It was some years since he had made any very careful trial of the alkaline treatment. It had occurred to him to ask, How long does rheumatism take to get well of itself? Until that point was settled, how could they determine what to do? He regretted that they had not had out that discussion on Dr. Stewart's paper on the previous day. Who could venture to say this or that treatment was or was not successful, if he did not know how long the disease was likely to last of itself. He had tried everything—there was no drug he had not tried—in rheumatism; and he found them all pretty much alike. He had tried nothing, and the result had been the same. He had tried the blanket, with the same result. They had given the alkaline treatment a most careful trial in Edinburgh, and it had seemed to him to shorten the duration of the disease a little. In Edinburgh, they saw a great deal of rheumatism in servant-girls, on account of the system of washing adopted there. Girls got up very early in the morning to wash, and in all weathers, without care as to clothing, they alternated carelessly between the hot steaming kitchen in which the washing was done and the open air, often bitterly cold, where they hung the clothes to dry. He thought

he had observed that, where a strong young girl of this sort was seized with rheumatism, the acute symptoms had a tendency to disappear in about six or seven days; and if there were much complication, it would disappear in about fourteen or fifteen days. If the girl were weak, they found that murmur at the heart for which formerly violent remedies—mercury and so on—were given. Then, as, under the influence of rest and good diet and warm, comfortable treatment, the patient became stronger, the murmur went away. In the old time, when mercury was given in these cases, it generally so happened that the murmur went away about the same time as the mercury touched the gums; and so it was concluded that the murmur went away in consequence of the mercury touching the gums. Now mercury was not given, and yet the murmur went away as soon. They had come to the conclusion in Edinburgh that, in one of the healthy cases he had named, if alkalies were used—they gave nitrate of potash—instead of being seven days, the average duration of the acute symptoms was six days and a half. He had given nitrate of potash regularly ever since coming to that conclusion. His view was that acute rheumatism cured itself. It had once been said that six weeks in bed was the best cure for everything; and he had noticed that, of Dr. Stewart's cases mentioned on the previous day, the average duration was forty-two days, which was just six weeks.—*British Med. Journ.*, Aug. 25, 1866.

21. *Chronic Albuminuria, originating during Convalescence from Scarlet Fever and other Eruptive Diseases.*—Dr. Hermann Weber read a paper on this subject before the Royal Medical and Chirurgical Society, in which he stated that his remarks do not refer to the well-known and easily recognized acute scarlatinal dropsy or desquamative nephritis of scarlet fever, but to a chronic form of albuminuria originating occasionally at a much later period, when recovery had apparently been established already for several weeks. The author related three cases of scarlet fever, unattended with albumen in the urine or any other symptoms of renal complication during the first four weeks from the commencement. The subjects of the cases appeared quite well at the end of about a month, when they returned to their usual mode of living; but about three or four weeks later the general health became disturbed (loss of appetite and strength, headache, glandular swellings, boils, anæmia, and occasional sickness), and the urine, as soon as the patients came under treatment was found highly albuminous. Perfect recovery took place in one case; while in another the general health became much improved, but a slight degree of albuminuria has remained; and in the third case death occurred seven years after the commencement from broncho-pneumonia, with uræmic symptoms, the post-mortem examination exhibiting waxy degeneration (amyloid) of the kidneys. The author maintains that the connection between the scarlet fever and the renal disease in this class of cases is not the same as in the acute scarlatinal dropsy; while the latter may be considered as a part of the scarlet fever process, the former, originating at a much later period, is probably only so far connected with the scarlet fever that through it a greater susceptibility to the development of chronic renal disease is effected, in the same way as there results a tendency to other chronic affections, like glandular swellings and eruption of boils. The author believes that the same tendency may be caused also by other acute diseases, especially those of an exanthematous nature, and gave two cases in which chronic albuminuria took its origin in persons who had lately recovered from erysipelas of the head and typhoid fever respectively, in both of which cases, during the febrile state and during the convalescence, the urine had been quite free from albumen. He referred also to a similar case occurring after typhus fever, and described by Dr. Johnson in his work on Diseases of the Kidneys (London, 1852, p. 408). The author was inclined to infer from such cases that amongst the many cases of Bright's disease the origin of which is uncertain, a not inconsiderable proportion may have been developed during the later stages of convalescence from exanthematous diseases; that, therefore, as urged already by Dr. Johnson with regard to fever, particular care ought to be taken during these stages with regard to diet, clothing, habitation, avoidance of over-exertion, and

exposure to cold and damp air. Dr. Weber further pointed out the insidiousness of the commencement of this chronic albuminuria, as, in four cases out of the five related, anasarca and admixture of blood with the urine were altogether absent. Lassitude, loss of strength, anorexia, swelling of the lymphatic glands, and eruptions of boils, being the principal symptoms, ought, therefore, always to lead to an examination of the urine, the more so as by an early discovery of the renal disease the chance of a perfect cure is much increased, as seen in two of the five cases reported.

The treatment consisted in attention to skin and diet; in the administration of iron which acidulated acetate of ammonia, and occasional doses of elaterium to relieve the kidneys, and in the use of the hot vapor bath or the warm wet sheet.—*Med. Times and Gaz.*, Sept. 29th, 1866.

22. *Training, or Forced Exercise in the Treatment of Diabetes.*—Professor BOUCHARDAT, while admitting the efficacy of alimentary treatment in diabetes, considers it only as palliative, and he recommends the adoption of energetic exercise. This idea is not a novelty on his part, as in former writings he recommended, in the case of patients affected with this complaint, the energetic action of their bodies and arms; and then he ascertained that labour in the open air always promotes the utilization of the feculent matters in diabetic patients. It is not sufficient in all cases to cause the disappearance of the sugar, but, all things being equal, in regard to the quantity of feculent matters absorbed and other conditions, a diminution in the proportion of sugar contained in the urine always coincided with exercise in the open air. M. Bouchardat gives an instance of remarkable success in the treatment of diabetes attained by this treatment, the diet being carefully regulated and the urine being examined at intervals. Although the patient may at first be very weak, the adoption of exercise will gradually give him strength. It is of the greatest importance, according to M. Bouchardat, to use the strength in proportion as it returns; and daily exercise of the body, arms, and legs is indispensable. The greatest care must be taken to find some daily exercise which is agreeable to the patient—as, for instance, in the case of men, hunting, rowing, fencing, skating, billiards, cricket, &c.—or any ordinary manual employment, as sawing, cleaving wood, turning, and the active work of gardening; and in women, all the active household employments, especially those which require the action of the legs rather than standing without walking. Riding in a carriage is not to be adopted except when no other exercise is possible; but riding on horseback is a salutary kind of movement, although it cannot be substituted for all the others. Of all the modes of exercise, that which is most convenient must be chosen; and it ought to be energetic, so as to produce a thorough sweating over the whole body; and then all necessary precaution should be taken to prevent the chance of chilling the system. M. Bouchardat relates several cases in which his system was successfully adopted in the treatment of diabetes; he considers the exercise of the gymnasium especially useful when such an establishment is well conducted, and he gives some rules to be followed by the patients. When the exercise has been continued for about an hour, and all the body is bathed in sweat, the flannel should be changed, and the skin washed briskly with cloths soaked in cold water, then strongly rubbed with coarse gloves or towels, or flesh-brushes. Then the body is to be struck and kneaded, so as to produce a complete reaction, which is sustained by a walk of a quarter of an hour at least, the body being protected by good woollen clothes. The skin should not be neglected while these exercises are used, and salt-water baths, either warm, or, what is better, cold, if they can be borne, are, according to M. Bouchardat, of almost invariable utility. During the treatment the diet must be carefully regulated, glycogenic substances being avoided while the urine is diabetic, and resumed only when the sugar has disappeared. The red wines of Bordeaux or Burgundy may be drunk; but sparkling wines, like champagne, should be avoided. Coffee and tea, without sugar, are sometimes suitable, but their employment must be regulated by the condition of the urine after they are taken.—*British and Foreign Medico-Chirurgical Review*, Oct. 1866, from *Bulletin Général de Thérapeutique*, Dec. 30, 1866.

23. *Change of Type in Disease.*—Dr. Symonds has ably discussed this subject in a letter addressed to Dr. Markham, published in the *Med. Times and Gazette*, Oct. 6, 1866. We give a few extracts from that letter:—

"Why has this powerful remedy [venesection] fallen into comparative disuse? My answer would be prompt and unhesitating: it is because, under my own observation and the observation of many of my medical brethren in various parts of the country, inflammations have become less frequent and less violent, and when they have occurred they have been accompanied by a condition of the whole body that has not borne much depletion or lowering by any measures, and has often required a speedy use of stimulants. Nearly thirty years ago the attention of the profession was directed by Dr. Stokes,[1] in words which I have never since forgotten, to that stage in inflammatory cases when stimulants must take the place of antiphlogistic remedies. Now, that stage in my early experience used to come only after a long persistence of the opposite condition. But when the 'change of type' in inflammatory cases became manifest, it was, among other signs, betokened by this particular fact, that the state of depression came on much earlier than formerly—nay, that some cases began where others used to end. * * *

"One word, before closing this long letter, on the *à priori* argument for or against what is called change of type in disease. It seems to me that all analogy is in favour of the probability that in different eras human beings should be differently affected by such an agency as abstraction of blood. When the practice of it was most common, limitations were always kept in view as to the subjects to whom it was applicable, and the degree to which they could or could not bear it. Every practitioner knew that there were persons in regard to whom it was necessary to exercise great caution, and others who by circumstances of age, or habits, or previous disease, or by idiosyncrasy, or by what was termed "the epidemic condition," were altogether unfit for the remedy. If this held good as to individuals or limited classes, I do not see why it might not prove true of great numbers—nay, of the majority of the community—as in late years and at the present time. If over at least two decades of years there has been a remarkable prevalence of epidemic catarrh followed by a great variety of neuralgic disorders—if there are times when boils and carbuncles become rife to a degree unknown for one or two generations—if diseases so characterized by asthenia as diphtheritis come and establish themselves as new calamities—I do not see why inflammations may not in certain periods of time assume peculiar aspects, especially in regard to the subject which we are reviewing. I cannot consent to discuss inflammations in relation to our present inquiry as if they were definite organisms, like objects of natural history. Even allowing that pneumonia, or meningitis, or peritonitis, is the same in Peter as in Paul (though this is quite open to question), yet when we have to consider the cure of these diseases, especially in their acute forms, we of course really have to consider the cure of the men, women, and children afflicted with these diseases, and in whom the local inflammations may, over various periods, be attended with conditions of the whole body as peculiar to the time as those which are presented in furuncular, and catarrhal, and choleraic or other epidemics. As to some of these, it may be alleged, with less or more of probability, that, apart from alterations in human diatheses, there have been importations or developments of new seeds of diseases, surmised germs, or cells, or ferments; but even these hypothetical agents would hardly cover all the cases in which certain disorders become rife at particular times. What successions or conjunctions of agencies from air and vapour and the imponderable forces of nature, or what malarious emanations of the earth, or what changes in food, and habits, and clothing, and occupation, may bring about certain changes in human constitutions in particular times, so that inflammatory diseases shall be more asthenic and less fit for treatment by abstraction of blood, we cannot pretend to conjecture. But there is no *à priori* improbability that such causes have been in operation. Just about twenty years ago a terrible epidemic—terrible because

[1] In the chapter on the Treatment of Bronchitis in his masterly treatise on Diseases of the Chest, p. 114.

of the famine it brought upon a whole people—attacked the potato plant. There were suppositions of insects, or fungi, or of some morbific materies imported; but, however much or little truth there may have been in those conjectures, it is but too obvious that the plant shows at the present epoch an asthenic constitution to such a degree that if the summer and autumn prove more rainy than usual, the plant is less able to bear the evil influence of the weather than in old times, and that it sickens in its leaf and decays in its tuber. Would that we could suppose the human body to be impregnable to analogous influences? * * *

"One word more, and I have done. It has been my lot to observe diseases in different parts of England, and to compare my observations with those of other physicians, and one of the results of my experience (it was long before 'change of type' came to be discussed) was that inflammatory cases were more sthenic in some districts than in others. If this experience may be trusted, and if, under the outward agencies operating in certain districts, diseases can be more or less characterized by strength or debility, is there not a probability that, in the ever-shifting combinations and sequences of meteorologic and other influences in successive periods of time, the whole population of a country may present varying phases of disease in general, and of inflammation in particular?"

SURGICAL PATHOLOGY AND THERAPEUTICS, AND OPERATIVE SURGERY.

24. *Development of Epithelial Cancer in Internal Organs.*—Dr. C. OTTO WEBER says that secondary cancroid deposits are found in internal organs much more frequently than is believed. His researches have been made chiefly in the liver and lungs. The epitheliomata in internal organs, he says, are developed at the expense of the nuclei of the interstitial connective tissue and not of the proper epithelial cells of the organs. He gives several instances of the coexistence of epithelial cancer and tubercle in the same organs. From experiments on animals, Dr. Weber is led to conclude that these secondary cancers are developed like metastatic abscesses. They do not arise from cells detached from the original cancer and carried along in the circulation; but the embolus exerts some inexplicable catalytic influence, and its presence determines the excessive growth of nuclei of connective tissue, with the result of forming a secondary cancer.—*Gaz. Méd. de Paris*, June 16, from *Virchow's Archiv.*

25. *Results attending the Removal of the First Growth of Cancer.*—Mr. JOHN BIRKETT, Surgeon to Guy's Hospital, in an interesting communication read before the British Medical Association at its meeting in August last, presented the results attending the excision of the entire mammary gland, or a part of it, when involved with a cancerous growth. "He is obliged," he says, "to do this without taking into consideration many collateral circumstances of very great importance; such as the condition of the integuments, of the axillary lymphatic glands, the duration of the growth, the progress made by the disease in each individual case, the variety of the disease, and other points. The above, singly or collectively exert much influence on the result; but it would occupy too much time to enter upon these important details at this meeting."

With a view to answer the question, What advantage does a patient obtain by submitting to the removal of a cancerous tumour? Mr. B. gives the results of his investigation of one hundred and fifty cases carefully recorded by himself. A majority of these patients are dead, for the investigation was commenced eighteen years since. No selection of cases was made. "These statistical tables and deductions therefrom by means of averages afford," Mr. B. admits, "fallacious guides to treatment.

"Table A is arranged to show the length of time during which 150 patients

were free from any indications of the local recurrence of the disease after the removal of the first growth.

"A.—*Table showing the length of time during which* 150 *patients were free from indications of the local recurrence of the disease after operation.*

	Cases.
Before the expiration of the first year	87
Between expiration of first year and close of second	15
" second and third	7
" third and fourth	7
" fifth and sixth	5
" sixth and seventh	2
" seventh and eighth	1
" eighth and ninth	3
" ninth and tenth	1
" tenth and eleventh	3
" fourteenth and fifteenth	1
" fifteenth and sixteenth	1
Sixteen years	2
Patients died free from local disease in part first affected (see table)	15
	150

"Before the expiration of the first year, eighty-seven patients showed signs of a new development of the growth, either in the portion of the mammary gland not removed, the integuments in the neighbourhood of the cicatrix, in that structure itself, or in the axillary lymphatic glands.

"After the expiration of the first year, and before the conclusion of the second, fifteen patients showed that a cancerous growth was again developed in one or other of the regions above mentioned.

"Now, this large proportion of the cases in which recurrence occurred might be taken as a significant fact to demonstrate that the cases submitted to operation were badly selected; that, indeed, an operation was scarcely justifiable. But, in many of the cases, the operation was undertaken in the hope of removing the source of great local pain and mental distress; of alleviating the misery and to abate the annoyance attending an ulcerated and sloughing surface, and at the earnest solicitation of the sufferer.

"In some, I confess, little, if any, advantages were gained. In others, although life was not prolonged by many months, the existence of the individual was rendered more tolerable, since the attendant circumstances before described were sometimes absent. Life was decidedly prolonged in a few cases, in which it was rapidly ebbing in consequence of repeated hemorrhages and deeply sloughing masses.

"Further, we may be allowed to suggest that many of the cases in this category might have been operated upon at a much earlier period after the discovery of the first growth, and with every probability of a happier result. But in hospital cases, and a large majority were of that class, it too often happens that patients apply to such institutions as a last resource only.

"We may now turn to a somewhat brighter picture. To be free from such a disease as cancer for periods of time extending between three and sixteen years is a fact surely sufficient to justify almost any means to accomplish such a desirable end. The risk of life attending the operation is not great, and now much of the horror of such a proceeding is mitigated by the employment of anæsthetics.

"In the wards of a hospital, even where the chances against the recovery of the patient are greater than in private practice, I calculate the death-rate at only seven per cent. During the last seventeen years, two hundred patients have been operated upon by my colleagues and myself in Guy's Hospital. Either the whole or a portion of the breast-gland was removed on account of a carcinomatous growth. All of these recovered from the effects of the operation, with the

exception of fourteen, who survived it between three and thirty-six days only. It must be admitted that the operation was more or less the exciting cause of the disease which terminated life. These fatal diseases were erysipelas, followed by bronchitis; inflammation of the pleura, terminating in effusion; pyæmia; hæmoptysis; and vomiting. In fact, the too common causes of fatal complications after operations upon the poorer classes, inhabitants of large cities.

"But in private cases the mortality is so trifling that, admitting the risk to which every person submits who undergoes any operation, I am inclined to calculate it at not more than three or four per cent. I have lost only one patient, of forty-one cases operated upon for cancer.

"To proceed with the remaining cases. Of the patients, thirty-three in number, who survived the operation without any local recurrence of the cancer for periods varying between two and sixteen years, assuredly many of them must have died of the complaint within those periods; and all of them would certainly have been compelled to endure the mental anguish, if not the local suffering, accompanying the existence of this terrible malady, assuming that they had survived equal periods.

"Lastly, fifteen of the patients died without showing external signs of recurrence of cancer in the region first affected.

"B.—*Cases in which the cancer did not reappear in the part first affected with that growth.*

Case.	Survived operation.	Cause of death.	Condition of local disease at operation.
1	6 months	Hepatic disease	Integuments infiltrated
2	10 months	Thoracic disease	In same condition
3	11 months	Hepatic disease	As above
4	13 months	Carcinoma in calvaria	Mammary gland only infiltrated
5	15 months	Disease of ovary	As above
6	2 years	Cerebral disease	Integuments infiltrated
7	2 yrs. and 2 mos.	Hepatic disease	Integuments infiltrated & ulcerated
8	3 years	Thoracic disease	Mammary gland infiltrated only
9	4 yrs. and 3 mos.	Cerebral disease	Same as above
10	6 years	Thoracic disease	Integuments infiltrated
11	6 years	Cerebral disease	Integuments infiltrated & ulcerated
12	6 yrs. and 6 mos.	Exhaustion	Mammary gland infiltrated
13	6 yrs. and 8 mos.	Thoracic disease	Integuments infiltrated
14	10 yrs. and 6 mos.	Cachexia	Integuments ulcerated
15	11 years	Cachexia	Mammary gland infiltrated

"The Table B shows the length of time each individual survived the operation. This was between six months, the shortest time, and eleven years, the longest. In another column is stated the cause of death in each case, which was the development of cancerous growths in the viscera of either the cranium, the thorax, or abdomen, as determined by well-marked indications during life or by post-mortem examinations.

"I have introduced, on the same table, as brief a description as possible of the condition of the local disease at the time of the operation; and it should be noted that it had made considerable progress in some of them. The integuments were infiltrated with cancer; in some ulceration of the surface existed. Under these conditions we are justified in assuming that some of the patients would speedily have fallen victims to the ravages of the complaint, and that all must have endured more or less of the suffering accompanying its progressive stages.

"By the removal of the growth, these fifteen patients were exempt from the misery inseparable from the activity of the local disease.

"Let us next inquire if the life of individuals afflicted with cancer of the breast is prolonged by the removal of the part first involved by the disease.

"c.—*Table to show the number of years 150 patients survived the discovery of the disease after the removal of the first growth.*

Under 1 year	8	Above 10 years	2
Above 1 "	24	" 11 "	2
" 2 years	38	" 12 "	1
" 3 "	17	" 13 "	1
" 4 "	21	" 14 "	2
" 5 "	7	" 15 "	1
" 6 "	5	About 23 "	1
" 7 "	10	" 29 "	1
" 8 "	4	" 32 "	1
" 9 "	4		

"I have arranged Table c to show the number of years 150 patients survived the discovery of the disease after the removal of the first growth. Rather more than one-half died before the expiration of the fourth year, or in the ratio of fifty-eight per cent.; the majority dying before the completion of the third year.

"Thirty-three died before the expiration of the seventh year, or in the ratio of twenty-two per cent.

"Eighteen died before the conclusion of the tenth year, or in the ratio of twelve per cent.

"Twelve survived above ten years, or in the ratio of eight per cent. One person lived about thirty years after the discovery of the disease.

"In order to form some comparison between cases subjected to the above treatment, and those in which the disease was allowed to pursue its natural course, with the exception of using local palliatives and constitutional measures, I calculated the average duration of life of a hundred patients.

"Fourteen of these patients died within the first year after the observation of the disease; three survived its discovery above ten years, two of them having lingered under its slow progress about twenty-six years.

"The average duration of life I believe to be about three and a half years.

"Of the cases, then, which have fallen under my own observation, it is quite certain that the longest survivors have been those from whom the first growth was removed.

"Whether the duration of life was really essentially due to the removal of the first growth, I would not venture to assert dogmatically; for there are many collateral circumstances which require to be taken into consideration for which the time is insufficient upon the present occasion.

"In conclusion, I trust that I have demonstrated to my sceptical professional brethren that a certain proportion of cancer patients can receive benefit by submitting to the removal of the first growth of the disease; and that the benefit derived from the operation is twofold, viz., 1, prolongation of life; 2, exemption from the disease for a considerable period of time in many instances."—*Brit. Med. Journal*, Sept. 29, 1866.

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26. *Elephantiasis of the Scrotum.*—Prof. James Syme reports (*Edinburgh Med. Journ.*, Nov. 1866) the following interesting case of this in which he successfully extirpated the tumour.

G. W., æt. 26, applied to him in the early part of August last on account of an hypertrophied scrotum, which presented the characteristic features of elephantiasis. "The tumour was so large as not only to produce great inconvenience, but to render any active employment impracticable. The left leg, from the knee downwards, presented an enlargement of the same kind, to nearly twice its natural size. The young man stated that he had gone to Australia three years ago, and that three months after being there he had observed the swelling of his scrotum, which, since then, gradually increased, and, more recently, had been followed by that of the leg.

"On the 28th of August, having placed the patient on his back, and administered chloroform, I introduced a blunt-pointed curved bistoury into the opening, from which the urine issued, and cut through the body of the tumour directly upwards, so as to expose the glans, then extended this incision to the pubes,

and down to the body of the penis, which was detached from its connections, and held up by an assistant. I next cut laterally through the tumour, so as to expose the left tunica vaginalis, which, having been separated from its surrounding attachments, was held in the hand while an incision was carried along the cord to the pubes, and then transversely to the groin; the same procedure was repeated on the right side, so as to give the wound a T form; and, lastly, while the organs that had been saved were held out of harm's way, I detached the mass by a free use of the knife.

"The operation, as just described, was performed without any delay or difficulty, and in one slight respect appears an improvement of the plan pursued by Dr. Fayrer, who makes three longitudinal incisions—one of which is in the direction of the penis, and the others along the spermatic cords. Instead of this, searching latterly for the testicles through the soft substance of the tumour after digging out the penis, and using them as guides in cutting up towards the pubes, may, I think, perhaps be found more convenient. Little blood was lost, as the gentleman who assisted me quickly compressed the vessels. Some folds of lint supported by a bandage, were placed over the penis and testicles to keep them in their proper position, which, in the course of a few days, they were found to retain with the most natural aspect, and contraction proceeded so rapidly that the patient was able to return home before the end of three weeks. At the end of a similar period he came to show the wound almost completely cicatrized.

"It is worthy of notice that the leg, which presented such distinct features of elephantiasis as made me hesitate to undertake removal of the scrotal tumour, diminished quickly after the operation, so that when the patient left the hospital there was hardly any trace of the enlargement. Had the femoral artery been tied, this spontaneous improvement would doubtless have been attributed to a procedure that, so far as I can see, has no foundation on any sound surgical principle."

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27. *Galvanic Cautery in Varicocele.*—P. B., æt. 44, had suffered during eight years from a large varicocele on the left side. On January 29th, M. AMUSSAT applied the galvanic cautery to the varicose veins of the spermatic cord. The mass of veins, having been first isolated carefully from the vas deferens, was surrounded by a loop of platinum wire, the two ends of which were brought out through the same opening in the skin, and placed in connection with a Middeldorpf's apparatus. As soon as the circuit was established, the wire became incandescent; and in a few minutes the vessels were cauterized and divided. The operation was very painful, but was well borne. The only dressing applied was a little cotton wool in a suspensory bandage. In the evening, the patient was a little feverish; but afterwards he had no pain nor any bad symptoms. He kept in bed eighteen days, and, at the end of May, the cure remained complete. *Brit. Med. Journ.*, Oct. 27, 1866, from *Bull. Gén. de Thérap.*, June 30, 1866.

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28. *Results of the Operation of Complete Excision of the Astragalus, performed by British Surgeons.*—Mr. H. HANCOCK, Prof. of Surgery in the Royal College of Surgeons, in a recent course of lectures gives the following statistics:—

"I have collected 57 cases. Of these, 33 were for compound dislocation; of which 5 were complicated with fracture, 12 were for simple dislocation, and 3 were for caries.

"Of the 33 performed for compound dislocation, 24 recovered with good, useful limbs; 1 underwent secondary amputation of the leg, and recovered; 8 died, of whom 1 had undergone secondary amputation.

"Of the 12 performed for simple dislocation, 9 recovered with good and useful limbs; of these 12, in 4, of whom 1 died, the bone was allowed to remain for a month; in 1 it was allowed to remain nineteen weeks; in 4, of whom 2 died, the bone was removed immediately.

"Of the 3 performed for disease, 2 recovered with good and useful limbs; 1 recovered for a time, but the disease returned in two years, necessitating amputation of the leg, the patient, however, doing well.

"In 3 the cause is not given. Of these, 1 died, and 2 terminated well.

"If to these we add 52 cases performed by surgeons abroad, we get 109 in the whole.

"Of these, 64 were for compound dislocations, of which, 5 were complicated with fracture; 4 were for compound fracture; 20 for simple dislocation; 10 for disease (caries); 1 was for necrosis; of 10 the causes are not stated.

"Of the 64 excisions performed for compound dislocation, 50 recovered with good and useful limbs; 1 underwent secondary amputation of the leg, and recovered; 11 died, of whom 1 had undergone secondary amputation; of 2 the results are not given.

"Of the 4 operated upon for compound fracture, 3 recovered with good and useful limbs; 1 died.

"Of the 20 operated upon for simple dislocation, in 4, of whom 1 died, the bone was allowed to remain for a month; in 1 the bone remained for nineteen weeks; in 7, of whom 2 died, the bone was removed immediately; in 2 the bone was removed for secondary caries, but at what period it is not stated. In the remaining 6 the period of removal is not given.

"Of these 20, 14 recovered with good and useful limbs; 3 died; in 3 the results are doubtful.

"Of the 10 cases performed for disease (caries), 6 recovered with good and useful limbs; 1 submitted to secondary amputation two years afterwards, and recovered; 1 died; in 2 the results are doubtful.

"The patient operated on for necrosis did well.

"Of the 10 cases the causes of which are unknown, 2 recovered with good and useful limbs; 1 died; in 7 the results are not known.

"So that of the 109 cases, 76 recovered with good and useful limbs; 2 submitted to secondary amputation, 1 recovered; 16 died, including 1 in which secondary amputation had been performed; in 14 the results are not known."—*Lancet*, Sept. 29, 1866.

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29. *Ovariotomy twice successfully performed in the same Patient.*—Mr. T. Spencer Wells reported a case of this to the Royal Medical and Chirurgical Society, November 13, 1866. He alluded to three cases in which ovariotomy had been performed twice on the same patient. The first was by Dr. Atlee, of Philadelphia, sixteen years after the previous operation by Dr. Clay, of Manchester. The second was by the author, nine months after an operation by another surgeon. The third was by Dr. F. Bird, fourteen years after one of his own operations. The first case was successful. The second and third were not. The case now related is believed to be the first in which ovariotomy has been performed successfully twice on one patient by the same surgeon. In this case the author removed the left ovary of an unmarried woman, twenty-four years of age, in February, 1865. The tumour weighed twenty-nine pounds. The right ovary was then healthy. The patient recovered, and remained well more than a year. But, in about fifteen months, disease began in the right ovary, and advanced so rapidly that ovariotomy was performed for the second time eighteen months and a half after the first operation, and a tumour, weighing eighteen pounds, was removed with complete success. A full account of both operations was given, with a description of the tumours removed; and some remarks were added upon the comparative frequency of disease in one or both ovaries, and upon the appearance of disease in one ovary after the other had been removed. The author showed that the right and left ovaries are found diseased with equal frequency; and that in from one-third to a half of the cases where the disease has gone on to its termination in death, *both* ovaries are diseased. But he asserted that both ovaries are affected in much smaller proportion in the earlier stages of the disease. In the first one hundred and fifty cases in which he performed ovariotomy he only removed both ovaries in seven, and in only three others was disease in an early stage suspected in the ovary not removed. In three the ovary not removed, but examined and found healthy, had become diseased afterwards. In two of these cases the disease was malignant. The rule appears to be established that after a successful ovariotomy the patient is restored to good health; and, although there are occasional exceptions to this

rule, it is satisfactory to know that if the remaining ovary should become diseased, the first operation need not add much to the difficulty of the second; and that of four cases in which a second ovariotomy has been performed, two have proved successful.—*Med. Times and Gaz.*, Nov. 24, 1866.

30. *Reduction of the Subcoracoid Dislocation of Humerus.*—Dr. ALEXANDER GORDON states (*Brit. and For. Med.-Chir. Rev.*, Oct. 1866) that he has successfully employed, in nine consecutive cases, the following mode of reducing this dislocation:—

"If the right shoulder be dislocated, I place the patient on his back, with the shoulders raised, in bed, or on a mattress laid on the floor, or on a sofa. Standing on the same side and raising the elbow, I grasp the lower end of the right humerus; the thumb on the inner, with the fore and other fingers on the outer side, the forearm lying flexed at an acute angle, resting on the web between the thumb and fingers. I raise the arm upwards and forwards, so as to place it at right angles with the surface upon which the patient is lying. Besides, to have complete muscular quiescence, I tell the patient to permit the extremity to rest upon and be supported entirely by my left hand. With the right hand I feel for the head of the dislocated humerus, and press it downwards and outwards, either through the anterior wall of the axilla or in the axilla, moving at the same time, with the left hand, the lower end of the humerus upwards and backwards, with rotation chiefly inwards.

"Whilst thus engaged, I have felt on several occasions a snap or jerk, so marked as to lead me to suppose, for the moment, that the dislocation was reduced. This snap or jerk is due to the head of the humerus having changed its position; for when we depress it we free it from the coracoid process, and the supra- and infra-spinati muscles, being on the stretch, jerk it outwards to the anterior border of the glenoid fossa. When in this position, with the fingers in the axilla, I can feel almost the whole of the upper articular surface of the humerus, which I press outwards and forwards; or, in other words, I lift the head of the humerus over the inner margin of the glenoid cavity, assisting with the left by rotation and very slight extension, if necessary, when the head enters the glenoid fossa with a distinct snap."

Dr. Gordon is convinced that this mode of reduction is equally applicable to other forms of dislocation of the humerus.

31. *Paraffin for the Construction of a Stiff Bandage in Fractures.*—Mr. LAWSON TAIT some time since proposed the use of paraffin in the construction of a stiff bandage for the treatment of fractures. Further experience has confirmed his judgment as to the utility of that substance.

"For the application of this substance as a stiff bandage," he says, "it must be used in its pure state. It may be used as other substances are for this purpose, either with the bandage alone or to fix the bandage over wooden or pasteboard splints. In simple fractures I prefer to use it with the bandage alone, without any other splint. For this purpose I first enroll the limb with a soft cotton bandage, and over this I apply a series of strips of coarse flannel bandage, dipped in the melted paraffin. The paraffin may be melted in an ordinary little tin saucepan. After the flannel has been applied as far as is wished, it is to be allowed to set, and is then to be coated over with paraffin by means of a bristle brush. This is best accomplished by stirring the melted substance with the brush until it cools sufficiently to be slightly viscid; by this means a thicker and more uniform coat is obtained. When properly put on, the bandage has a peculiarly neat and clean appearance. Its advantages are that it is much lighter than any of the other substances used for the same purpose, that it is cleaner and cheaper, and that a supply of paraffin is almost everlasting; for after a bandage has served its purpose, it only requires to be boiled, and all the paraffin is got back. It takes up no fluid, and for this reason Dr. Heron Watson used it in preference to anything else in a case of fracture of the thigh in a child, where the greatest difficulty was encountered in keeping the little creature dry. In this case the success was perfect. The same gentleman has used it in a simple fracture of the leg successfully, and uses it together

with a straight outside splint as a stiff apparatus after operations for clubfoot. The property of not absorbing fluids renders it particularly useful in cases of compound fracture or any such condition where there is much discharge.

The only objection that I could imagine to its use was that it might be softened by summer heat; but this, I am now satisfied, does not occur. In a case of fracture of the humerus in which I applied it recently, the patient mentioned that it was a great relief to have it instead of the wooden splints in which his arm had been inclosed for some days after the injury.

Paraffin may be easily procured from any chandler, as it is now extensively used in its pure state as paraffin candles. By dissolving about a hundred grains of paraffin in an ounce of chloroform, and dropping a little of this on the skin to the extent required, a moderate amount of counter-irritation may be obtained. The mixture is simply allowed to dry on the surface, when the scaly paraffin may either be brushed off or allowed to remain as a protection to the irritated surface."—*Med. Times and Gaz.*, Nov. 3, 1866.

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32. *Chlorate of Potash in Phagedæna.* By Dr. E. Tillot.—Chlorate of potash has been employed for some years as an external application in ulcers, cancerous affections, and scorbutic gingivitis. It has been successfully used in the troublesome ulcerations following some blisters. It is daily used in the Hôpital des Enfans, in Paris, in the dressings of wounds covered with diphtheria. The chlorate may be used externally, either in solution, or as an ointment; in solution, in the proportion of ten to twelve grammes (a gramme is about fifteen grains) to six hundred grammes of water; as an ointment, two grammes to thirty of lard; and it may be mixed with glycerine. The mode of application differs according to the disease, and it may be by injection, lotion, or friction, once or twice a day. Dr. Tillot says that the chlorate has hitherto been very little employed in phagedæna, and as he has found it to produce a remarkable effect in this disease he thinks it interesting to communicate his experience of its effects. He relates six cases of phagedænic syphilitic disease, in most of which the chlorate was successfully employed; and he remarks that all the patients were free from constitutional cachexia, and were for the most part vigorous persons. In all of them the chancres were multiple, and belonged to the variety of *soft chancre*. The effects of the treatment were all manifested at the beginning of the medication; and although the contact of the chlorate was painful to bear, it was never so great as to compel its discontinuance. Its first effect, Dr. Tillot states, is to relieve the pains, when there are any; to diminish the intensity of the suppuration, and to modify its nature by changing the appearance of the morbid surface; but where it excels all other remedies is in its power of arresting the disease, in its spreading character. The action of the salt in phagedæna is not rapid, but it is constant.—*British and Foreign Medico-Chirurgical Review*, Oct. 1866, from *Bulletin Général de Thérapeutique*, March 30, 1866.

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33. *Use of the Endoscope.*—The following remarks on this subject by Mr. Christopher Heath, of the Westminster Hospital, will be read with interest and profit:—

"I have been working with Cruise's modification of Désormeaux's endoscope for some months, and have latterly obtained very satisfactory results with it as regards diagnosis at least, for more time is necessary to test the treatment by means of the endoscope in all its branches. I have used Désormeaux's original instrument, as well as Cruise's modification of it; and I certainly give the preference to the latter, on account of the improved light, and the fact that it can be readily moderated as circumstances may require, although I think that Cruise's instrument might be simplified by doing away with the rachet, etc., used to bring the lens opposite the flame of the lamp. This appears to me quite unnecessary; for, the lamp being fixed, the lens should be fixed too; and I find in my instrument (which I send you), that, having once raised the lens about a quarter of an inch, it requires no further adjusting, unless, indeed, as sometimes happens, it gets accidentally depressed in using the instrument.

"I have examined endoscopically a large number of cases of gleet, and can

confirm Désormeaux's statement that the majority of them depend upon a granular condition of the mucous membrane of the urethra at some point or other, and most frequently at the bulb. This granular condition frequently leads to a form of stricture of the urethra evidently due to the state of the mucous membrane; for, after treatment applied to the granulations by the topical application of a strong solution of nitrate of silver (gr. xx ad ʒj), the normal calibre of the urethra is restored, without the use of any form of bougie whatever. It is obvious that the recognition of this form of stricture (which, from what I have seen, I imagine to be far from uncommon) will necessitate a more accurate diagnosis and more varied treatment than is now generally adopted; and I think it not unlikely that those cases of stricture which have been satisfactorily treated from time to time, and specially by Mr. Wade, with the bougie 'armed' with caustic potash, have been instances of 'granular stricture'. Désormeaux believes, and I think with justice, that a simple granular stricture may in course of time develop into a *bonâ fide* condensation of the submucous tissue, and thus give rise to the more commonly recognized form of stricture.

"The diagnosis of an indurated, even of only very slightly contracted, portion of the urethra, by the endoscope, is very easy; and a very little practice will enable one to distinguish the sudden and uneven contraction of the condensed tissue upon the end of the tube, as contrasted with the uniform and gradual closure of the healthy urethra upon it, which so closely resembles the familiar closure of the vaginal or rectal mucous membrane upon the speculum. When the stricture is too tight to admit of the passage of the tube which is being employed, the face of the stricture is at once brought into view, and is very characteristic; the canal being sometimes narrowed to a minute central aperture, at others being more or less slit-like, and this slit having varying degrees of obliquity, as figured by both Désormeaux and Cruise in their illustrations.

"I have not had the opportunity as yet of ascertaining the exact site of the aperture in a case of impassable stricture; but I am quite confident that it would be possible to do so, as in the case related by Désormeaux, where he succeeded in passing a catgut bougie through a stricture which had failed the practised hand of Civiale. I have had the opportunity of examining one case of stricture after the use of Mr. Holt's dilator, and can confirm Dr. Cruise's account of the appearance presented. The case was one which admitted a No. 5 catheter, which endoscopically showed the canal converted into an oblique slit. After the operation, when No. 10 catheter could be readily passed, this slit was seen to be considerably increased, particularly at the upper part; and, on passing a tube through the stricture, it was seen that the mucous membrane beyond was paler than normal, and that the induration extended beyond the point where the stricture was split.

"With regard to the examination of the bladder, I found Désormeaux's angular tube so difficult to introduce, that I had a catheter and tube made upon the plan suggested by Dr. Cruise, which allows the bladder to be washed out, and the endoscopic tube to be used through the same instrument. With this I was able to examine the bladder of a man suffering from paralysis and consequent chronic cystitis, and was able to see very satisfactorily the congested condition of the mucous membrane. I last week had the opportunity of examining the interior of the female bladder in a patient of Dr. Ray, of Dulwich, and used for this purpose Désormeaux's tube most satisfactorily. This lady had been suffering from obstinate hæmaturia, and I was able to show Dr. Ray the anæmic condition of the mucous membrane in its greater part, and also a distinct growth springing from the left side of the bladder, and no doubt the source of the hemorrhage.

"In conclusion, let me say that practice is needed in the use of the endoscope, as with every other 'scope'; and warn those who are short or long sighted to use their glasses when looking through the tube of the endoscope, or they may fail to focus the tissue at the end of it."—*British Med. Journal*, Sept. 15, 1866.

OPHTHALMOLOGY.

34. *Paralytic Ectropium successfully treated by Operation.*—Mr. Haynes Walton records (*Brit. Med. Journ.*, Sept. 15, 1866) the following highly interesting case of this.

"A gentleman, aged twenty-four, was sent to me by Mr. R. Reid, in January of this year, on account of a distressing and increased ectropium of the left lower eyelid from facial paralysis on that side, which occurred in childhood. It is unnecessary to speak of the condition of the face. The ectropium produced much deformity, as the margin of the eyelid was very much depressed, and the conjunctiva was thickened and projecting, and very vascular. But a more annoying result was the constant flow of tears and mucous secretion over the cheek, roughness of the skin, and some excoriation.

"After a short examination I was convinced that I could render essential benefit, and my patient readily assented to my proposal of treatment.

"Chloroform having been given, I removed a strip of the diseased conjunctiva along the entire length of the eversion; and I may mention that I effected this by making two incisions with a scalpel, in the form of an ellipse, and dissecting away the isolated bit. It is by the contraction that ensues from this loss of substance that the eyelid is braced up, and in ordinary cases of ectropium I generally excise as much of the conjunctiva as is permanently exposed, and that effects the desired end. But here the lengthening of the tarsus, and the total loss of muscular support to it, required something more to be done; and also, the undue raising of the upper eyelid was another obstacle to success. To overcome these complications, I shortened both tarsi by removing a portion of each at the outer canthus, taking away conjunctiva as well, and brought the wound together by stitches.

"It is not necessary to give a detailed account of the progress. It will answer every purpose merely to tell that the repair was rapid, and as effectual as it was possible. The eyelids are nicely bound up, and the stare arising from the prominence of the eyeball, and the exposure of it is almost overcome; so little indeed remains, as not to be noticed by a casual observer. The punctum lacrymale in each eyelid having been returned to its proper position, the tears are thoroughly conveyed away through the proper channels. Withal, there is no trace or mark of the use of the scalpel."

35. *Cases Illustrating the Occasional Connection between Neuralgia of the Dental Nerves and Amaurosis.*—Mr. J. Hutchinson compares certain cases of amaurosis with infantile paralysis; he says: "Certain cases of amaurosis appear to me to bear a very close resemblance to infantile paralysis. Without any warning whatever, without any other cerebral symptoms, a patient loses the sight of one eye; now and then, but only very rarely, of both. In some cases there is a certain amount of improvement afterwards, but often the amaurosis is total and permanent. In some instances the optic disk becomes white and atrophic, but in others it retains an almost normal vascular supply. Most of the subjects of those cases which have come under my notice are women. In some there is evidence of cardiac disease, but in others there is not, and in most I have found the arteria centralis of good size; so that the hypothesis of embolism seems to have but little support. In several of the best-marked cases that I have seen, there was the history of neuralgia in the face for long periods before the amaurosis, the neuralgia being usually connected with toothache. I am quite alive to some of the sources of mistake which attend the attempt to prove the occurrence of paralysis from reflex irritation consequent on a peripheral cause. Chief amongst them we have, of course, the possibility that the neuralgia itself may have been due to central disease, and that the extension of the latter may have implicated other nerves. I must leave the following cases to make their own impression on the mind of the reader. Whilst endeavouring to avoid forming hasty opinions, I may still venture the practical remark, that I believe we pay far too little attention to the state of the teeth as

possibly productive of disturbances of function, or of nutrition in the eyeball, or even in the cerebral centres of vision. . . . In the case of adults, it is surely the duty of our profession to take every opportunity of spreading information as to possible ill-consequences of retaining stumps in the jaw."—*Ophthalmic Review*, Oct. 1866, from *Ophthalmic Hospital Reports*.

MIDWIFERY.

36. *Age of Nubility.*—The *Edinburgh Medical Journal* for Sept. 1866, contains a highly interesting paper, by Dr. J. MATHEWS DUNCAN, the object of which is to point out the ages within which women generally should enter the married state, if they are to be guided by physiological laws. Dr. D. does not consider puberty to be always contemporaneous with the age of nubility; the latter, he considers, to depend upon the age at which the pelvis reaches its full structural development in shape and form. He shows satisfactorily, that the mortality of first labours, and the fecundity of the female are to a great extent influenced by the age at which marriage takes place, and in conclusion, he expresses the conviction that "the age of about from 20 to 25 is the nubile age of woman." "Below 20 years of age," he says, "woman is immature, she runs considerable risk of proving sterile, and if she does bear a child she runs a comparatively high risk of dying in child-bed; besides, her early marriage brings many other disadvantages. The woman above 25 years of age is mature, but to counterbalance this, she encounters some greater risks than the very young wife's, though of a similar nature.

37. *Morbid Conditions and Injuries of the Spleen in the Pregnant and Parturient States.*—Sir. J. Y. SIMPSON, at a meeting of the Obstetrical Society of Edinburgh (June 27, 1866), referred to three cases of fatal rupture of the spleen which had occurred respectively in the pregnant, parturient, and puerperal states. He pointed out the circumstance that, during pregnancy, there is often, if not generally, an increase of the white particles of the blood—or, in other words, a kind of normal or physiological leucocythemia. As in states of morbid leucocythemia, the spleen was often enlarged; so was it also occasionally in pregnancy. Perhaps it would be found in practice much more common than the silence of authors on the subject might lead medical men to suppose. It sometimes recurred in successive pregnancies. In one patient of his, the spleen became enlarged to a very marked degree in a series of successive pregnancies, and this splenic enlargement disappeared always after delivery. Her youngest child is now about ten years old, and during that time there has been no recurrence of the splenic hypertrophy in the mother. A certain amount of softening very frequently accompanies the hypertrophy of the spleen, and predisposes to the laceration of the organ under strong exertion and muscular effort, blows, etc. The first case of rupture of the spleen in a child-bearing mother which he saw was a patient of Dr. Husband's. She began to show symptoms of fatal sinking shortly after premature labor set in, about the sixth or seventh month. On opening the body after death, the enlarged spleen was found lacerated, with effusion of blood into the peritoneal cavity. Shortly afterwards, a patient of Dr. Wilson's, who had been delivered a week or two before, after making some unusual muscular exertion, complained of abdominal pain and sinking, and died. Rupture of the spleen and effusion of blood were found on dissection. The late Dr. Cunningham of Currie delivered a patient in Edinburgh, using the forceps. He left very shortly afterwards, to catch the railway train. The patient sunk and died within an hour or two. An inspection of the body was ordered by the law authorities when rupture of the spleen, and consequent effusion of blood were found to be the immediate cause of death.

Dr. Burn stated that Sir James Simpson had seen a patient of his lately where the spleen was very much enlarged during pregnancy. The patient died soon after her confinement.

Mr. Furley mentioned one case of a similar kind, where the patient died one hour after delivery.

Dr. Charles, of Calcutta, said he had seen many cases of different kinds where the spleen during pregnancy became enlarged and indurated. In one case, the spleen of a male patient was ruptured from throwing himself suddenly back in defending a blow. At the post-mortem examination the spleen was found ruptured, and of a red-currant jelly consistence. Such cases were common even from false steps, or in going down stairs. He thought such accidents were more common in India than here.

Dr. Wilson mentioned a case of ruptured spleen occurring shortly after delivery, which he had reported to the Medico-Chirurgical Society a number of years ago; and which he believes was reported in the Monthly Journal at the time.

Dr. Ritchie, of Derby, said he had seen cases of rupture of the spleen associated with bronchocele.

Dr. Keiller said that he generally found, in cases of splenic disease, that bleeding was difficult to stop, and he never advised leeching in such cases.

Dr. Sidey mentioned one case of enlarged spleen during pregnancy, where rupture followed an act of overstretching, and the patient died.—*Edinburgh Med. Journ.*, Sept. 1866.

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38. *New Mode of treating Epithelial Cancer of the Cervix Uteri and its Cavity.*—Dr. Routh, in a paper read before the Obstetrical Society of London, (Oct. 3, 1866), after referring to the able papers of Mr. Moore on Cancer, said that the use of bromine as a local agent was first suggested to him by his colleague, Dr. Wynn Williams. Dr. Routh then related two cases admitted under his care at the Samaritan Hospital. In the first, the patient was thin, pale, and haggard, losing blood continually. There was a mass of fungoid epithelial growths, taking their origin from the os uteri, and about the size of an egg. The actual cautery was used to check the bleeding, and after the slough had come away a solution of bromine—five minims, to fifty of spirits of wine—was used. A piece of lint, the anterior surface of which was well saturated with the solution, was applied to the uterine diseased surface, and kept *in situ* by pledgets of lint. After forty-eight hours it was removed, and the part dressed at night with a poultice of lint dipped in warm water, and during the day warm douches were applied. In about a week a slough came away, and left a large healthy granulating surface. Tannin with glycerine was applied, and used daily. The patient also took internally the iodide of arsenic with extract of conium. After a period of ten weeks she was fat, hearty, and well-coloured; but as she occasionally lost a drop of blood, Dr. Routh carefully examined the internal surface of the uterus, and found about a quarter of its lining membrane affected with epithelioma. She left the hospital for some weeks, and on being readmitted a piece of wood about the size of the uterine cavity was prepared, and covered with cotton; the upper part was dipped in a saturated solution of carbonate of soda, the lower in the bromine solution, and it was passed up and left within the uterus. Two or three further applications of bromine with glycerine were necessary, and the patient left the hospital with a movable healthy uterus.

In the second case there was a large carcinomatous mass, about the size of an orange, attached to the os, which appeared to be large cauliflower excrescences, breaking down readily and bleeding at the slightest touch. On January 20 the mass was removed by the wire écraseur, and a few days afterwards the spirituous solution of bromine was applied. She took internally the iodide of arsenic and conium, and was treated in the same manner as the first case. She left the hospital on April 2, with a movable uterus covered with healthy mucous membrane, and looking herself fat and hearty.

The author remarked that he was quite aware that two cases afford an insufficient criterion as to the value of any remedy, and that time had not been allowed to prove that the cures were lasting. Notwithstanding these objections, he thought, at the same time, there was some considerations which made an early publication of these cases desirable. The author concluded by drawing

attention to the care necessary in mixing the bromine with the spirits, which should be done very gradually, to avoid an explosion. He hoped others would try the agent he now brought forward, and give the results of their experience. He believed it to be a potent and useful remedy, and likely to prove of service, if not in the cure absolutely, at least in the arrest of the progress of cancer.—*Med. Times and Gaz.*, Nov. 3, 1866.

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39. *Clitoridectomy.*—The following testimony of Dr. CHARLES WEST against the utility or propriety of this operation will be read with interest:—

"1st. Having for the past twenty-five years seen more of the diseases of children and young persons of both sexes than most members of my profession, and as much as most of the diseases of women at all ages, I believe that masturbation is much rarer in girls and women than in our own sex.

"2d. I believe the injurious *physical* effects of habitual masturbation to be the same as those of excessive sexual indulgence, and no other. The special *physical* harm done by masturbation I believe to be due to the fact that it can be indulged in at a much earlier age than sexual intercourse, and can be practised with much greater frequency.

"3d. But, nevertheless, I have not in the whole of my practice seen convulsions, epilepsy, or idiocy *induced* by masturbation in any child of either sex; a statement, I scarcely need add, widely different from the denial that epileptics or idiots may, and not seldom do, masturbate. Neither have I seen any instance in which hysteria, epilepsy, or insanity in women after puberty was *due* to masturbation as its efficient cause.

"4th. I *know*, and I can appeal with confidence to the knowledge of many members of the medical profession, that of the alleged cures of hysteria, epilepsy, insanity, and other nervous diseases of women by excision of the clitoris, a very large number were not permanent. I further *know* that in several instances, one of which, seen by me in consultation with Mr. Paget, is related at p. 663 of my lectures, very mischievous results have followed it.

"5th. Although the moral questions involved in the practice of masturbation are not strictly within the province of medicine, yet, as the quotation from my lectures, taken apart from the context, may appear to imply that I believe the mind could be restored to its purity by any means which our art might furnish, I must add that I hold no such opinion.

"We too often see the man in whom desire has outlived the power of performance for the dream to be possible that there is any necessary connection between infirmity of body and purity of mind; and most of your readers do not need to be reminded that the judgment of the Church as well as the sympathy of all are with the struggle and self-conquest of St. Jerome rather than with the voluntary mutilation of Origen.

"6th. Whilst I believe the removal of the clitoris in cases of hysteria, epilepsy, insanity, and other nervous diseases of women to be a proceeding theoretically based on erroneous physiology, and practically followed by no such results as to warrant its frequent performance, I regard it as completely unjustifiable when done for the alleged relief of dysuria or of painful defecation, for the cure of amenorrhœa, or for the mitigation of the symptoms of uterine misplacement or disease.

"7th. I consider that public attempts to excite the attention of non-medical persons, and especially of women, to the subject of self-abuse in the female sex are likely to injure society, and to bring discredit on the medical profession. I think that such attempts are the more objectionable when associated with a reference to some peculiar mode of treatment and alleged cure practised by one individual.

"8th. I believe that few members of the medical profession will dissent from the opinion that the removal of the clitoris without the cognizance of the patient and her friends, without full explanation of the nature of the proceeding, and without the concurrence of some other practitioner selected by the patient or her friends, is in the highest degree improper, and calls for the strongest reprobation."—*Lancet*, Nov. 17, 1866.

AMERICAN INTELLIGENCE.

ORIGINAL COMMUNICATIONS.

Case of Fracture of the Thyroid Cartilage and the Lower Jaw. By PHILIP S. WALES, M. D., Surgeon U. S. Navy.

J. W. S., age 30, born in Massachusetts, admitted May 2d, with a severe compound fracture of the inferior maxilla, implicating its anterior third, the fragment of shell producing it passing through the floor of the mouth, making an ugly lacerated wound, and coursing over the neck obliquely to the middle of the right clavicle, causing its fracture (compound). There was profuse hemorrhage from the mouth, which was checked by persulphate of iron; the patient can only speak in a whisper. Applied water dressing, and a light retentive bandage composed of a few turns of a roller to hold the fragments of bone together.

May 4. Removed three large fragments which, it was evident, would not consolidate from being almost entirely separated from the maxilla. There is emphysema over the clavicular fracture, leading all the medical officers to agree with me in the opinion of the probability of a penetrating wound of the chest.

5*th.* The tongue is considerably retracted towards the throat from the destruction of the origin of the muscles which thrust it forwards; still whispering voice, attributable to jaw injury; has some fever. Gave neutral mixture with spts. ætheris nit.

6*th.* The patient looks badly; several pieces of shell were removed from the face to-day; he complains of oppression in the chest, near the wound. Stimulants given freely.

7*th.* Is worse; required constant watching last night; cannot articulate distinctly; is evidently doomed to die. 3 P. M. Died.

Autopsy ten hours after death.—Laceration of floor of the mouth and comminution of inferior maxilla. *Chest.*—To the surprise of all, the right lung was found perfectly healthy, the fracture of the clavicle not communicating at all with the cavity of the chest; search was then made to discover the cause of the emphysema surrounding it, and a remarkable fracture was found passing through the right wing of the thyroid cartilage beginning at a quarter of an inch from the pomum Adami upon its upper border and extending downwards and backwards to its lower border; there was ecchymosis of the mucous membrane of the laryngeal ventricles, and the space of an inch below them was red. I should observe here that this fracture caused no displacement of the respective parts of the cartilage, and was as clean as if done with a knife, or like a fissure extending through a glass plate; there was no emphysema over or in the neighbourhood of the larynx to lead me to suspect a lesion of this organ. The whispering, and afterwards inarticulate voice, could well be accounted for by the jaw injury; the oppression of breathing, pain in the chest, and emphysema over the fractured clavicle, naturally indicated the chest as the seat of the principal trouble.

Case of Fractured Skull with Loss of Brain; Recovery. By J. M. SNYDER, M. D., Maple Row, Romney, Hampshire Co., West Virginia.

On the 15th of April, a son of Col. Fox, about eight years old, was run over by a horse and thrown violently upon a jutting rock, which fractured the skull extensively. About two hours after the accident I was called to the case, and upon examination found the injury to be at the middle portion of the temporal arch, between the parietal protuberance and frontal suture, implicating a portion of the frontal bone. A portion of the parietal bone one inch and a half in length and of an elongated triangular form, was forced endwise into the middle lobe of the brain, penetrating its investing membranes and entering its substance.

Parts of the parietal, frontal, and temporal bones were fractured into five and six pieces, making a comminuted, depressed space of four inches, which presented a concave appearance, with a wound in the centre of the depression about one inch in length. After removing the hair and enlarging the wound to the extent of two inches to facilitate the extraction of a portion of the parietal bone completely hidden in the cerebral mass, I extracted the piece of bone with forceps, and removed about a tablespoonful of the middle lobe of the brain, which followed the extraction of the bone. After this the little fellow aroused up, and made a considerable struggle to rise, but was held quiet by assistants. The struggle caused a second protrusion of the brain, which being detached from the cerebral mass, as I supposed, was cut away with the surgeon's scissors.

I then proceeded to raise with an elevator the depressed pieces of bone to their normal position, which was accomplished with considerable difficulty, and not without a good deal of force. It was, however, by perseverance, accomplished satisfactorily, when the wound was dressed with adhesive plaster, and a light compress, leaving a small space between the strips to permit the blood, &c. to escape.

During the operation the little fellow was perfectly comatose, except for a moment immediatly after the removal of the bone. He was now placed in a well-ventilated and quiet apartment, closely watched and under the constant surveillance of a doting mother. Although a very tractable and obedient child, yet it was necessary for those around him to watch him closely, as his position was frequently and abruptly changed from side to side with quick and sudden tossings. He frequently placed his hands on the wounded part, but complained of very little pain. He was very closely watched during the night and next day by myself, and on the following night, about thirty hours after the operation, reaction took place, which required for the protection of the brain three copious bleedings about an hour apart.

This free abstraction of blood had the desired effect of reducing arterial action and quieting the whole system.

On the following day I deemed it proper to excite the bowels to action, which was done by enemata, and subsequently by giving quarter minim doses of ol. croton tiglii mixed with bread crumbs, repeated every two hours until some effect was manifested. After this an occasional pill of the same was given, which by one or two repetitions always acted pleasantly and kept the bowels in a soluble condition. No further evidences of excitement manifested themselves during the progress of the case.

The head and wound were washed, cleansed and dressed twice a day for a few days, and subsequently but once a day, and recovery was unexpectedly rapid, in three weeks he being able to walk in his room, and the little fellow is now (October, 10th) in robust health and fine spirits.

In this case I feared the occurrence of fungus cerebri, but this unpleasant consequence has not taken place, and probably will not, as it is now five months since the accident. I feel confident the boy's intellectual faculties have not sustained the slightest degree of injury.

On the 16th of August, four months after the accident, he had an attack of scarlatina simplex which passed off without an unpleasant symptom, and without any medical treatment other than a tepid bath and confinement to his room.

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Pruritus Pudendi successfully treated by Sulphite of Soda. By SAMUEL B. FRIZELL, M. D., of Grangerbury, Ohio.

In September, 1866, I was consulted by a lady suffering from pruritis pudendi following menstruation—accompanied with great irritation and much pain.

Having read of the influence of sulphite of soda on sycosis menti, the idea suggested itself to me of trying the same in this case. I accordingly prescribed for her the following local application: Sodæ sulphis ʒj, aquæ ʒiij, glycerinæ ʒj, M., which was to be used quite often. In three days no trace of the disease was apparent.

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Tænia Solium successfully treated by Turpentine. By CHARLES C. SHOYER, M. D., of Leavenworth, Kansas.

A clergyman, who had been troubled with tænia for four and a half years, and had been subjected to various remedies, applied to me. I ordered half an ounce of Ol. terebinthinæ to be taken at 10 A. M., fasting, and a half ounce at 1 P. M., an interval of three hours; directing half an ounce of Ol. ricini at half past one o'clock; this last was superfluous for in ten minutes after taking the second dose of turpentine the worm was expelled entire, in a mass, and proved to be fifteen feet long. The remedy caused slight intoxication and strangury which speedily passed off.

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Two Cases of Poisoning by over-doses of the Fluid Extract of Gelseminum. Reported by REZIN P. DAVIS, of Parkersburg, W. Va.

On the evening of October 6th, 1866, I was called to visit Mr. C. H. B., a young lawyer of our city, who was reported as being very ill. I answered the call immediately, and found him in the following condition:—

He was lying upon his left side, face somewhat congested, pupils dilated, but responding to the different degrees of light; eyelids half closed, with apparent inability to move them; lower jaw drooping, and his tongue, to use his own expression, "was so thick he could hardly speak;" his skin was warm and moist; pulse small and feeble, and his respirations somewhat diminished in number. He had neither purging nor vomiting.

Upon my questioning him as regards his condition, he told me that "he and a friend had been enjoying themselves in a social way for some three or four days," and that nothing was the matter with him now "but extreme nervous prostration." He also told me that he had not taken medicine of any kind. Thinking, as he did himself, that he was merely prostrated from excessive dissipation (he being of a very nervous and delicate constitution), I ordered him a brandy punch, and went to the drug store for some medicine.

Whilst waiting for the prescription to be filled, his friend Mr. S. came staggering into the store, saying, "I am blind; I cannot see. What in the world is this I have taken? (at the same time showing a bottle). My

friend B. is down town in the same fix." I examined the bottle, and found it plainly labelled "Fluid Ex. Gelseminum." I asked him how much they had taken? He replied, "B. and I have each taken a tablespoonful." I immediately sent my student, Mr. White, to see Mr. B. and give him an emetic, with other remedies to be given after he had vomited. I then gave Mr. S. an emetic which acted freely; after which I gave him quin. sulph. ʒj in spt. vin. gal. ʒiv. In a few minutes Mr. White returned and said Mr. B. was dying; and that it was with great difficulty that he got him to swallow the emetic, which had not acted. Dr. A. G. Clark accompanying me, we hastened to where Mr. B. was, and found him in a dying condition, pupils widely dilated, spasmodic breathing, surface cold and congested, pulse almost imperceptible, and totally unconscious. Mustard was applied to the extremities, his body sponged with hot brandy, and artificial respiration, but all to no effect. He died at 8.30 P. M., about two hours and a half after he had taken the poison.

I returned to Mr. S.; found him still inclined to sleep, with deep inspiration, and a numbness of the whole body. I repeated the quinia and brandy, but in only one-half the quantity given before, and kept him walking about, with the aid of two of his friends. At ten o'clock he was feeling quite comfortable. Considering him out of danger, I sent him to bed, when he slept soundly all night, waking in the morning feeling, as he said, "quite well, but weak and dizzy." He recovered without any further difficulty.

The fluid extract taken by the above parties was prepared by Tilden & Co., New Lebanon, N. Y. There being no antidote to poisonous doses of gelseminum given in the U. S. D., I was at a loss to know how to act and what to do. But acting upon general principles, I first vomited Mr. S. freely, and then gave him the large doses of quinia spoken of above. My reasons for giving the quinia were these: gelseminum being a powerful nervous sedative, when taken in large quantities, acting upon the brain and nervous system generally, and quinia being a cerebral stimulant, I thought that large doses of quinia might rouse the nervous centres to action; through this to restore tone and vigour to the heart, and equalize the circulation. I am satisfied that the quinia had a good effect, for Mr. S. had taken the gelseminum nearly ten hours before he took the emetic, giving the system time to come thoroughly under its influence. I am satisfied that had Mr. S. waited, and sent for a physician, that he would have shared the same fate as his friend and companion; that the time lost in so doing would have placed him beyond the reach of medical assistance.

Poisoning from Oleum Tiglii. By CHARLES C. SHOYER, M. D., Leavenworth, Kansas.

Some time ago I ordered ol. tiglii ʒiij, ol. olivæ ʒj, as a counter-irritant. This mixture was accidentally spilt over some pigeons and chickens cleaned and ready to be put on the fire. After being thoroughly washed in several waters they were thought fit to eat, and were prepared accordingly. Five persons in all partook of the meal, aged respectively, mother, 54 years and feeble, young lady of 15, girl 9, and two young sons of 17 and 19. I was sent for and learned the above; in addition, I found there was great anxiety and burning in the mouth and throat; this was about an hour after the meal. I informed them that violent purgation would probably be the only ill consequence, and that the mother would suffer most. Left a prescription for tr. opii deodorata, of which the youngest was to take 3 drops and

the others 10 drops every hour or two, according to the severity of the purging; all were to drink milk and keep quiet. The purging occurred and was relieved by the remedies. The next day early, after an interval of 18 hours from the accident, the mother was again attacked with purging, and while at her work felt a burning in the throat and mouth, and there were some pustules to be seen in the latter; she became faint, and commenced to vomit; there were muscular tremors and great general prostration. I found a very feeble pulse, slight tenderness of the abdomen, but none of the epigastrium; tongue white, showing impress of the teeth; feet cold, skin moist, mind clear. The vomiting continued an hour; the ejected matter was light and glairy, not tinged with bile, and contained no food. During vomiting, and for two hours after, there was a constant tendency to faint, and a deathly, indescribable feeling of prostration. Treatment consisted of flannels wrung out of hot water to the abdomen; large sinapism to the epigastrium; warmth to the feet; 10 drops of tr. opii deodorata every half hour in whiskey and water, and a liberal use of the fan. In four hours the patient was as well as ever, but very weak. Ordered as nourishment milk toast and farinaceous articles prepared with milk. At this writing, 55 hours since the accident, and about 30 hours since the last treatment, the patient is up and about.

Deficiency of the Integuments of the Abdomen and Spina Bifida in the same Child. By D. N. Rankin, M. D., of Alleghany City, Pa.

Mrs. S., after an easy labour, was delivered on the 29th of September, 1866, of a good-sized and living male child, deformed in a very remarkable manner. The integuments, as the skin, muscles, and fascia, were entirely wanting in the front part of the abdomen, extending from two to three inches above the umbilicus, down as low as the usual outlet of the alimentary canal. The contents of the abdomen projected so much as to produce the appearance of a large umbilical hernia, covered in its upper part, by the peritoneum only, which membrane extended down as low as a line drawn across the body, on a level with the anterior superior spinous processes of the ilium.

The umbilicus was in its natural position, and had attached to it a very short umbilical cord.

The lower part of the projecting mass was entirely denuded of peritoneum, as well as of all other integuments. The testicles stood out stiffly on each side of the penis; these, as well as all the other parts in the neighbourhood, being entirely bare of integument, had the appearance of a confused mass of raw flesh.

Besides the hideous aspect exhibited by the front part of the body, the back also came in for its share of abnormal conformation; for opposite the lower lumbar vertebra there existed a large tumour of the nature of hydro-rachitis or spina bifida.

As far as could be discovered this child breathed quite naturally, and showed indications of living for some little time at least; but judging from the great deficiency in its organization, it could scarcely be expected that its life could be prolonged to any very great extent.

During the first seven or eight days of the child's life, the mother not having any milk, it was fed with a spoon on cow's milk and water, which it took as freely as most newly-born children do. During this early stage of its life the evacuations from its bowels and bladder were normal. It lived twelve days, but during the few latter days of its existence it

took no nourishment, and exhibited symptoms of intense suffering, no doubt from the effect of inflammation in the exposed parts. An oozing of blood from the raw surface continued during the whole period of its short existence.

A post-mortem examination of this singular freak of nature would have been very desirable, but from unavoidable circumstances this was rendered impracticable.

Case of Rupture of the Uterus. Reported by B. H. CATLIN, M. D., of Meriden, Conn.

Mrs. Ann C., aged 40, was taken in labour with her seventh child, about 10 o'clock A. M., July 7, 1856. I was called about 1 P. M., and found her sitting up, in good spirits, with regular pains every four or five minutes. I anticipated no danger, having attended her in her six previous labours, which were perfectly natural and regular, though she always suffered more from strong pains than the majority of women. I soon made an examination, and found the first stage of labour completed—the head presenting in the first position. The labour progressed favourably, though not rapidly, till the head had passed the superior strait, when a very severe propulsive pain came on, which continued till the child was born, and even then there was no abatement of her suffering. I supposed, at the time, that the distress after delivery was from the shock to the system occasioned by such a violent pain and rapid delivery. According to my custom, in all cases of delivery, as soon as the child was put into the hands of the nurse, I placed my hand upon the abdomen, and found the uterus firmly contracted. I directed an attendant to give the patient some camphor and water, while I took hold of the cord. In a few minutes the placenta was thrown off by the pains. As my patient obtained no relief from her suffering, I administered a full dose of morphia, followed by stimulants, but as there was no improvement, and she was sinking very rapidly, I examined first with the finger, then introduced my hand, which passed through a rupture of the uterus among the intestines. Her situation seemed now hopeless, but as it was a very unusual case I requested her husband to call in my neighbour, Dr. E. W. Hatch, who made an examination. The patient never rallied, but died about thirty or forty minutes after delivery, and about four hours after I first saw her.

This is the only case of rupture of the uterus that has occurred in my own practice of over forty-one years. In the few cases I had heard of in our State the patients had died undelivered, or after the use of artificial means, and I was not aware at the time that any patient was ever delivered by the pains when a rupture occurred. After this I examined the cases reported by James D. Trask, M. D., in the fifteenth and thirty-second volumes of this *Journal*. Dr. Trask writes (vol. fifteen, p. 403): "Of 31 delivered by natural efforts, 20 died and 11 survived, and these include in both instances cases of rupture of the os in which the peritoneum was not involved." In the cases reported in the thirty-second volume I have counted 9 cases of natural delivery, making 40 cases in 418 reported.

My patient gave no sudden outcry, nor complained of any tearing sensation. The rupture was in the posterior part of the uterus near its connection with the vagina. I regret that we neglected to make a *post-mortem* examination. The patient was of a strumous habit; had a scrofulous tumour on the neck, but during her last pregnancy she had been unusually well. The child was born alive, but it was feeble, and died in forty-one hours.

Strictures of the Urethra.—Our venerable and highly esteemed correspondent, Dr. JNO. P. METTAUER, of Prince Edward Court House, Virginia, writes to us: "I have been treating strictures of the urethra for over thirty years, and I have cured every case, now over 400. I incise and dilate, and my modes of operating are intra-urethral and by the Rapho-perineal section. This last mode I first practised in 1836, during which year I treated two cases upon this plan, and how long before Prof. Syme operated I leave you to judge. I have living witnesses to prove my operations in 1836."

DOMESTIC SUMMARY.

Sickness and Mortality in the U. S. Navy during the year 1865.—We have been favoured with a number of highly interesting statistical tables which form part of the forthcoming Annual Report of Dr. P. J. HORWITZ, Chief of the Bureau of Medicine and Surgery of the U. S. Navy. We regret that the limited space at our disposal now, allows us to give only the general summary.

The following table contains a summary of the general results:—

	Aggregate number of officers and men on board of vessels in 1865.	Remaining sick Dec. 31, 1864.	Admitted in 1865.	Discharged in 1865.	Died in 1865.	Total treated in 1865.	Remaining sick Dec. 31, 1865.	Proportion of cases to number of persons on board.	Proportion of deaths to whole number of persons on board vessels.	Percentage of deaths to whole number of cases treated.
Hospitals . .	...	1,015	6,933	7,140	388	7,928	400	...	...	.048
Navy-yards, &c.	...	61	4,274	4,218	32	4,335	85	...	...	.007
Receiving-ships	3,241	64	2,560	2,544	30	2,624	50	.80	.009	.011
Vessels in commission at sea	29,400	1,531	36,545	37,278	480	38,076	318	1.29	.016	.012
	32,641	2,671	50,292	51,180	930	52,963	853	1.62	.028	.017

"*Casualties in the navy during the rebellion.*—The total number of persons injured from gunshot wounds, or from the explosion of gunpowder, in the navy, from April 12, 1861, to June 30, 1865, received in engagements with the enemy, is, as far as the bureau can ascertain, 3,266; of these 440 persons received two or more wounds at the same time.

"From casualties incident to the service, not connected with battle, during the same period, there were 2,070 cases, of whom 148 sustained more than one injury at the same time: the aggregate number of lesions being 2,286.

"The tabular statements appended to this report show the number of each class of wound or injury, amputations, excisions, &c., together with the results.

"*Insane of the navy.*—On the 30th of September, 1865, 4 officers, 5 seamen, 1 marine, 1 landsman, and 1 pensioner—12 in all—remained under treatment in the Government Hospital for the Insane near this city.

"During the year ending September 30, 1866, there were admitted 3 officers, 1 seaman, 3 landsmen, 1 coal-heaver, and 3 beneficiaries—total 11; the whole number under treatment during the year		23
The discharges in the course of the year were, by recovery, 1 seaman, 1 coal-heaver, and 1 pensioner—total . . .	3	
By death, 1 officer	1	
By elopement, 1 landsman	1	
	—	5
Leaving in the institution, on the 30th of September, 1866, 6 officers, 5 seamen, 1 marine, 3 landsmen, and 3 beneficiaries—total		18."

There are some highly interesting tables showing the number and results of gunshot fractures and injuries of bones and great cavities; number of amputations and excisions, with results; cases of paralysis from gunshot and other injuries; cases of ligation of arteries from gunshot and other injuries; cases of traumatic aneurism from gunshot and other injuries, &c. &c. &c.

"At the close of the year 1864 there remained under treatment 2,671 cases; during the year 1865 there occurred 50,292 cases of disease, injury, &c., making a total of 52,963 cases treated during the year, of which number 930 died, 51,180 were returned to duty or discharged the service, leaving 853 cases under treatment at the end of the year 1865.

"The average strength of the navy (officers, seamen, marines, engineer service, and coast survey included), for the year 1865, as nearly as can be ascertained, was about 32,641.

"The proportion of cases admitted to the whole number of persons in the service was about 1.62, or each person was on the sick-list $1\frac{62}{100}$ times during the year. The proportion of deaths to the whole number in the service was .023, and the percentage of deaths to the whole number of cases is .017, or less than two per cent.

"The total number of deaths from all causes reported at the Navy Department from October 1, 1865, to September 30, 1866, is 394."

This small mortality, less than 2 per cent., is highly creditable to the medical staff of the navy, and demonstrates the skill and care bestowed on the sick and wounded. No other naval service in the world embraces a larger proportion of highly educated, skilful, and conscientious surgeons than our own, and all that is now wanted is a proper recognition of their important services, by bestowing on them adequate rank and emoluments to stimulate them to higher cultivation, and to secure to the service the most intelligent minds in the profession.

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Use of the Thermometer in Diagnosis and Prognosis.—The No. of the *New York Medical Journal* for November last contains some interesting remarks by Prof. AUSTIN FLINT on the thermometric phenomena of disease, a subject which has latterly engaged the attention of clinical observers in Germany and Great Britain. The following propositions contain the substance of his remarks:—

"1. The thermometer is indispensable for obtaining accurate information of the temperature of the body, the perceptions of patients and the sense of heat or coldness communicated to the hand of the physician being alike fallacious.

"2. In the essential fevers and all acute affections, the heat of the body is more or less above the maximum of health; and the increase of heat, as a rule, persists during the career of the disease. Fevers and acute affections may, therefore, be excluded by the fact of the heat of the body remaining within the limits of health; and the existence of an essential fever or an acute affection of some kind may be predicated on a persistent increase of heat.

"3. A fever is purely malarial, that is, it is not a continued fever, nor is it associated with a continued fever, if, between the exacerbations, the temperature fall nearly or quite to the range of health.

"4. The diagnosis of neuropathic affections which simulate inflammations may be based on the fact of the temperature not being raised.

"5. Coma from uræmia may be discriminated from the coma occurring in fevers or dependent on meningitis, by finding the temperature not raised; and

in cases of uræmia, coma, and convulsions, intercurrent inflammatory affections may be excluded if the temperature remain normal.

"6. In tuberculous affections, when tuberculization is going on, there is more or less increase of heat. In cases of suspected tuberculosis, a normal temperature shows either that tuberculosis does not exist, or, if existing, that it is not progressive.

"7. In cases in which the history and symptoms excite fears of the existence of meningitis, the existence of this disease is not probable if the temperature be not increased; and, on the other hand, increase of temperature sustains these fears, provided the patient have not an essential fever.

"8. The amount of increase of heat, as shown by the thermometer, provided the increase be not transient, is proportionate to the gravity of the disease, and is a criterion of the immediate danger. A persistent temperature of 105° always denotes great severity of disease, and a still higher increase renders it almost certain that the disease will speedily prove fatal.

"9. The temperature in the different essential fevers and inflammations is governed by certain laws as regards progressive increase, daily fluctuations, and the rapidity or slowness with which it returns to the normal standard (defervescence) of the time of convalescence. Each essential fever or inflammatory affection has its own laws in respect of the points of difference just named; and any notable deviation from these laws, in individual cases, is an unfavourable prognostic. Thus, a decrease of heat below the normal range may indicate an internal hemorrhage, and a sudden increase may point to an important complication or the occurrence of an intercurrent affection. Mildness of the disease, and the absence of complications or intercurrent affections may, on the other hand, be predicated on the disease pursuing its regular course as regards temperature.

"10. The surest evidence of convalescence from an essential fever, or an acute inflammation, is a return of temperature to the normal standard. If an increase of temperature persist, after apparent convalescence, or, in self-limited affections, after they have reached the end of their career, either morbid conditions pertaining to the disease continue, or some affection has been developed as a sequel of the disease."

Comparative Merits of Incision and Dilatation of the Mouth of the Womb in cases of Dysmenorrhœa.—Prof. D. Humphreys Storer read, in August last, a highly interesting paper on this subject before the Boston Society of Medical Improvement. The large experience and sound judgment of Prof. Storer not only entitle his opinions to a respectful consideration, but his conclusions to entire confidence. He says: "From a somewhat extensive employment of sponge-tents during the ten past years for the treatment of dysmenorrhœa and sterility, I have formed conclusions different from those of the gentlemen of whom I have spoken [Drs. Barnes, Baker Brown, Greenhalgh, and Sims]. I have not unfrequently been disappointed in the result hoped for. The local obstruction has almost always been overcome by the long-continued, persevering employment of the dilator; but the opened canal does not always remove the condition thought to depend upon its closure—dysmenorrhœa and sterility still remain. I have, however, never seen the ill effects spoken of from the employment of tents. I cannot recall a single instance where more than a few hours' inconvenience has been produced; and in such cases the expanded sponge, when removed, has proved to have been originally much larger than it was supposed to be—showing that he who employs these tents should be acquainted with their uncompressed dimensions. My experience has taught me, then, that these contractions, however firm they may be, may almost invariably be overcome. The physician need not feel that the part is undilatable because the application of three, or five, or half a dozen tents does not overcome it; in a case occurring in my practice, about a year since, *eighteen* sponge-tents were introduced at intervals of two and three days before the canal was opened. My perseverance was rewarded by the perfect relief of the patient. I could point, were it necessary, to several cases where, after years of sterility, the sufferer has been relieved and borne children, and in the intervals of their childbearing have suffered no dysmenorrhœa. I have repeatedly seen cases of

dysmenorrhœa remain relieved for years, and known no return. In a word, I have relied upon dilatation to relieve these affections, and whatever opinions may be advanced by others, so long as I feel we have a remedy from which we can confidently expect relief, and very rarely observe any injurious effects, I shall feel it my duty to employ it.

"That cases do occur where the difficulty *cannot* be removed by dilatation, there can be no question; but 'that incision is the only efficient and permanent remedy (in most cases) for dysmenorrhœa,' I unhesitatingly deny.

"Let us for a moment look at the method proposed. Those who advocate it should of course be satisfied that it has superior claims over the means now employed. I have thought the ill effects produced by *distension* might be occasioned by want of care; but those arising from incision *may* follow the operation of the most skilful surgeon who advises it, when the metrotome cuts through the walls of the *inner os;* and Dr. Barnes states, to employ his own language, 'there is no doubt that the surgeon has actually cut through the substance of the uterus, and wounded the plexus of vessels outside; hence severe and dangerous hemorrhage has ensued, and inflammation of the peri-uterine tissues.' And even supposing the operation should be successfully performed, it is acknowledged by Dr. Routh, one of its advocates, 'that such an amount of contraction frequently exists as to render it necessary to have a dilating substance worn for a considerable length of time to prevent its perfect occlusion;' and Dr. Williams observes that 'oftentimes no relief is afforded. He had seen a patient whose cervix uteri had been slit up on both sides, forming two large protruding lips, without affording any relief to the sufferer.' Where the external os has been almost cartilaginous to the feel, I have overcome the obstruction with the hysterotome; but I have never attempted to divide the internal os. I cannot, however, recall the instance where it was required."—*Boston Medical and Surgical Journal*, September 27, 1866.

Cholera.—The *Cincinnati Lancet and Observer* of November last contains a very interesting report made to the Board of Health of Cincinnati, by Dr. ROBERTS BARTHOLOW, Consulting Physician to Mercy Hospital, from which we will make a few extracts. He confirms the views elsewhere (*Med. News*) expressed by us on some important points.

"*Excreta.*—No cases of *cholera sicca* were admitted. All had the characteristic discharges by stool or vomit, and, with one exception, by both. The gravity of the phenomena appeared to depend to a great extent upon the quantity of the discharge; *cæteris paribus*, those cases proceeded to a fatal termination most rapidly, in which the rice-water evacuations were most abundant.

"The discharges were alkaline. They consisted of a serous fluid, almost identical with the serum of the blood, columnar epithelium, and *debris*. Vibriones were not observed in a single instance.

"The urine was suppressed in all cases of collapse, and very scanty in the first and second stages of the disease. A direct ratio existed between the severity of the case and the amount of the urinary secretion. The specific gravity fell with the diminution in the amount, and albumen, epithelium, and tube casts appeared early and increased rapidly in quantity. I have not been able to note the condition of the urine before the accession of cholera symptoms, but the changes in the amount of its normal constituents and the appearance of abnormal ingredients, were manifest in the very inception of the diarrhœal stage—a fact of importance, equally in a diagnostic and therapeutical point of view.

"The perspiration was neutral or feebly alkaline. In the cases of consecutive fever with suppression of urine, a distinct urinous odour was perceived in the sweat.

"The alkalinity of the rice-water discharges, of the perspiration and the rapid diminution in the acidity and finally, the alkalinity of the urine, are very notable facts in the clinical history of the disease. * * * *

"*Morbid anatomy.*—The small intestines were generally well filled with flatus and rice-water matter, and were universally injected, minute vessels not ordinarily visible to the naked eye, having attained considerable size. The mesenteric vessels were also enlarged. In consequence of this increase of size it was

quite possible to trace the distribution of the vessels through the submucous coat and mucous membrane, to the capillary ramification. Remarkable and characteristic alterations were found in the epithelial layer of the mucous membrane. At the earliest period these alterations consist in a remarkable proliferation of the columnar epithelium and the production of degenerate forms. The villi are matted together by the new matter thus produced, and it adheres with more or less tenacity, all along the intestinal tract. Examined with a power of 300 diameters linear, this matter is seen to be composed of columnar epithelium, lower cell forms, occasionally a villus, and differs from the rice-water discharges in containing a much less amount of serum. In many parts of the intestine, especially in the ilium, nothing remains on the basement membrane, but this adhesive matter. After death by consecutive fever, large tracts, of the ilium especially, are found stripped to the basement membrane. There is in either case nothing intervening between the vessels of the submucous coat and the contents of the intestine, but the homogeneous, structureless basement membrane—for the cast-off epithelium is excrementitious matter. It is obvious that this destruction of the columnar epithelium arrests that vital power of selection and transference to the lacteals and veins, possessed by these cells. An outward diffusion current would therefore appear to be inevitable, and hence, the extraordinary congestion of the veins consequent upon the outward flow.

"Coincidently with these alterations in, and destruction of the columnar epithelium, the glandular apparatus of the small intestines becomes the seat of equally striking changes. The solitary glands enlarge, become filled with a milky fluid, and the patches of Peyer thicken. The mesenteric glands, also, enlarge somewhat. The solitary glands of the large intestine undergo similar changes. The liver is unaltered, except in the cases of consecutive fever. The gall-bladder contains bile in the usual quantity, and there is no obstruction to the entrance of it into the intestine; indeed, in almost every case bile was found in the small intestine, but unaltered in its physical and chemical characters. These changes in the columnar epithelium and in the glandular apparatus of the intestines, have the effect to arrest, at once and completely, the digestive process, and hence no feces are formed, although bile is present and appears at times in the discharges.

"The arrest of the primary assimilation and the rapid loss of the serum, occasion serious changes in the blood. To study these changes most satisfactorily, it is necessary to compare the blood of the portal vein, just despoiled of many of its constituents by the outward drain through the intestine, and the blood of some remote part of the systemic circulation. The blood becomes viscid; it cannot circulate through the lungs to receive oxygen, and the globules, the carriers of oxygen, are so damaged as to be unfitted for this function. Hence the lungs are found, after death, comparatively dry; the great venous trunks, the right auricle and ventricle, are gorged with blood, and the left cavities are empty and firmly contracted. This change in the fluidity of the blood induces a serious alteration of the red globules, most marked in the blood of the portal veins; they are irregular in outline, many of them are broken up, and the serum is crowded with *debris* and granular matter. I have frequently verified the observation that the tenacious matter found in the intestines, restores the arterial colour of the blood.

"The pleura, sac of pericardium, and peritoneum are coated with a gummy substance which adheres tenaciously to the hands, and so glues the pulmonary and costal pleura together, as to require, in some instances, no inconsiderable force to separate them, and must have increased the difficulty of respiration. This substance consists of cast-off epithelium and the lubricating serum deprived of much of its water.

"Early in the disease (death in a few hours after the first symptoms) the kidneys are found dry and bloodless, but this condition soon gives place to a deep congestion, when the pyramids and cortical substance become chocolate-coloured and microscopical vessels become visible to the naked eye. Subsequently the organs enlarge, the tubes of Ferrein and Bellini become crowded and choked with the cast-off epithelium and the Malpighian bodies are gorged with blood. These successive changes correspond with the different stages of Bright's disease,

and the rapidity with which they occur is one of the most remarkable phenomena in the clinical history of cholera.

"The cramps, the jerking respiration, and the præcordial anxiety, find a ready explanation in the condition of the intercranial circulation. The vessels of the base and of the hemispheres are much distended, and their finer ramifications brought into view. The sub-arachnoid spaces are filled with fluid, and the white substance presents on section, numerous bloody points. The particular change most deserving of attentive study, is the marked congestion of the medulla oblongata and pons Varolii. On one of the subjects examined, whose case had been particularly characterized by excessive cramps, and after death by a remarkable degree of *rigor mortis*, I perceived upon the right thigh a dried matter resembling semen. Carefully moistening it with distilled water I obtained a solution for microscopical examination, and ascertained that the dried matter was really semen. This is a striking fact, in confirmation of the view that the cramps are due to reflex action of which the medulla oblongata is the centre, or due to the congestion of this organ. This alteration in the circulation of the medulla oblongata and impairment of its nutrition, must affect the electrical relations of its molecules; hence the cramps. As the pneumogastric takes its origin from this centre, we have a satisfactory explanation of the jerking respiration and the præcordial anxiety.

"In the study of the pathological processes of cholera, we are at once arrested by the changes in the columnar epithelium of the intestinal canal, and the suppression of the renal secretion accompanied, or quickly followed, by extraordinary structural alterations. Which of these lesions is primary?

"If the cholera poison is contained in the rice-water matter, it probably acts locally upon the intestinal mucous surface, and all the other phenomena of the disease are secondary to the changes induced in the blood by the outward diffusion current. It becomes then a matter of prime importance to determine this point. Without designing it, I subjected myself to an experimental demonstration.

"*Experiment* 1.—A wound upon my left hand, bleeding freely at the time, was immersed in the various fluids of the body of a patient in the *post-mortem* examination. No result followed.

"*Expt.* 2.—A medium sized dog. Some fresh rice-water matter was injected subcutaneously, and a quantity was thrown into the rectum. Some local inflammation resulted from the injection, but no other effect was produced.

"*Expt.* 3.—Same as the preceding, except that considerable rice-water matter was also poured into the stomach. Same dog. He continued unaffected.

"*Expt.* 4.—Same dog. Some of the dried matter was made into a solution with water and a portion injected into the thigh, and the rest poured into the stomach. In fifteen minutes he had a free watery evacuation which was 'frothy,' but no other, and no subsequent symptom referable to the ingestion of cholera matter.

"As the gastric juice of the dog is powerfully acid, and his stomach digestion exceedingly active, it seemed desirable to bring the cholera matter into contact with some other mucous surface.

"*Expt.* 5.—Performed tracheotomy on the same dog, and injected some cholera matter into the trachea; also, threw some of the same matter into the nasal passages, and poured a quantity into the stomach. Recovered promptly from this rough treatment, ate food, but had no cholera symptoms.

"*Expt.* 6.—Same as the preceding, with the same result.

"The results of these experiments are, thus far, merely negative. They indicate, however, that the fresh rice-water matter, and the other fluids of the body in the recent state, are perfectly innocuous. The dried matter appeared to have more effect (Experiment 4). Our future experiments must be made with the rice-water discharges in a state of change, if anything may be accomplished in this way. The dejections are poisonous, if at all, under some as yet undetermined condition."

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Iodide of Potassium in Erysipelas.—Dr. H. B. WITHERS, of Rantoul, Illinois, states (*Chicago Medical Journal*, October, 1866) that he has used the iodide of

potassium in about thirty cases of erysipelas with perfect success. He gives it in doses of ten grains every two hours, observing closely its effects, and so soon as the disease begins to subside he discontinues the medicine. It arrests the disease, he says, in from twelve to thirty-six hours. He employs no external application, but simply keeps the parts covered and moist.

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Sulphite of Soda in Smallpox.—Dr. W. L. Nichol states (*Nashville Journal of Medicine and Surgery*, August, 1866) that he has employed the sulphite of soda in smallpox with advantage. He gave it in solution, in the proportion of one drachm of the salt to six ounces of water. A tablespoonful of this was given every three hours.

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White Pine Wood Bullet Probe.—Dr. V. Gelisch, of Los Angeles, Cal., recommends (*Pacific Med. and Surg. Journal*, Oct. 1866) a piece of white pine cut into the shape of a probe as a ready means of detecting a leaden ball in a wound. He says if such a probe be inserted into a wound and rubbed against the suspected object, and then quickly withdrawn, if the object be a leaden ball, traces of the lead will be plainly perceptible on the end of the probe. This will be useful where a Nélaton's probe is not at hand.

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Hospital Gangrene.—Dr. Martin L. Herr, of Lancaster, Pa., gives (*Nashville Journal of Medicine and Surgery*, August, 1866) the following statistics of hospital gangrene occurring among the wounded at Hospital No. 1, in Nashville, during the campaign which ended in the capture of Atlanta:—

"For the six months ending November 30, 1864, the following number of cases occurred, and were treated with the following results:—

	No. of cases treated.	Cured by one application.	Cured by two applications.	Cured by three or more applications.	No. of deaths.	Average number of days under treatment.
Bromine . . .	161	112	27	14	8	6.6
Nitric acid . . .	15	5	3	3	4	7.5
Sol. chlor. zinc . .	15	11	2	2	2	4.8
Spts. turpentine . .	3	...	...	3	...	6.
Permanganate of potassa	4	Failed--	cured by	bromine.		
Tinct. iodine . . .	2	...	1	1	...	7.5
Liq. sod. chlor. . .	2	...	...	2	...	4.5
Total . . .	202	...	...	...	...	...

"It will be seen that the majority of cases were treated with bromine, and most of them arrested by one application alone. The gangrene was considered cured when the wound presented a healthy granulating surface. Sol. chlor. zinc stands next on the list of the most successful agents. * * *

"During this same time, about three hundred cases were treated at the Cumberland Hospital with nitric acid; about fifty out of this number died, and many lost their limbs, showing that the nitric acid did about as much mischief as the gangrene. Nitric acid as a remedial agent in this disease, should not be used while we have remedies so much better, and which can be applied with so much less danger of destruction to the healthy tissues."

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Fractured Patella successfully treated by the Application of an Iron Ring.—Dr. W. A. Gibson reports (*St. Louis Med. and Surg. Journ.*, Oct. 1866) a case of transverse fracture of the patella thus treated. He took a measurement of the sound patella, and had a ring made of iron (allowing for padding), which he padded well with cotton wadding, cut in strips and wrapped around the ring, over which he applied a bandage. To each side of the ring he sewed strips of bandage. He then placed a well-padded splint twenty-four inches long to the posterior aspect of the leg and thigh, which was secured by a few turns of bandage

at the lower and upper ends, the bandage being loose so as not to interfere with the circulation. He next brought the two fragments of bone into apposition, and placed the ring around the patella, and tied the strips of bandage over the splint, thus securely holding the ring in its place, and keeping the broken bone always in complete apposition, thereby giving the greatest possible chance for a bony union. At the expiration of thirty days, he removed the ring, and commenced passive motion of the limb, and found the union to be bony and complete, and to-day (June 15th) he has very good use of the limb.

"The appliance," he says, "did not give the patient the least pain, and there was no interruption of the circulation by the bandages. It was impossible in this case for the patella to escape from the ring, but possibly in some cases, as of women, when there is a good deal of adipose tissue, and but little prominence of the patella, it may not be so easy to apply the ring; but I am persuaded that it will give entire satisfaction in all cases. I claim by the application of the ring to have reduced one of the ugliest fractures of the human frame to one of the simplest for treatment."

Self-retaining Speculum.—Dr. GEO. SYNG BRYANT describes (*St. Louis Med. and Surg. Journ.*, Oct. 1866) a modification of Sims' Speculum which seems useful, being self-retaining.

"This instrument consists of a blade *A* and lever *B*, with screws attached, so as to completely fit the lever to the sacrum and back, and to elevate or depress the blade at will.

"This speculum operates precisely in the same manner that the Sims' Speculum does, with the exception that it retains itself. The blade *A* is introduced into the vagina, and then connected with the lever *B* by the notched joint *C*. At the end of the fenestra *H* in the lever, a strap is attached which is to be carried around the body or waist, and tied before the pad, upon which the button *G* rests, is to be placed upon the sacrum. Above the bend of the lever is a slide *E*, to which is attached a screw with a button *G* at the end. This button rests upon the pad on the sacrum, and the screw is then turned until the requisite amount of tension is made upon the perineum.

"The screw *D*, at the lower end of the lever, which rests upon the arm *I*, of the blade, is now turned until the free or distal end of the blade *K*, is elevated or depressed, as may be desired, to the proper degree to bring into view the os uteri and the whole of the vagina, except that portion upon which the back part of the blade rests. This speculum is easily fitted, and its introduction is without pain to the patient. It was made by Leslie & Co., of this city, from a diagram. The accompanying cut is only one-third the size of the instrument."

Dr. B. states that when he contrived this Speculum, he was not aware that Dr. Emmet, of New York, had previously modified Dr. Sims' speculum so as to make it self-retaining, but, though Dr. E.'s modification, he states, answers well in lean women, with a thin, weak perineum, it does not do so well in muscular women.

Successful Removal of a Large Bronchocele.—Dr. Wm. Warren Greene records (*Medical Record*, Dec. 1, 1866) a case of this. The patient was a female 45 years of age, with an enlargement of the right lobe of the thyroid gland, which first appeared twenty-six years before, but had not given her any trouble until within the last eighteen months, during which time it had rapidly increased to its present size. "Its dimensions were now such that the common carotid was crowded behind the posterior edge of the sterno-mastoid muscle, where its pulsations were distinctly felt, and the trachea was pressed firmly to the left side. So great was the pressure upon these organs and the œsophagus that any attempt to swallow or talk gave her terrible spasms of dyspnœa. She was unable to lie down, and required constant watching during her broken sleep, lest she should die of suffocation. She suffered very much from headache and giddiness, and could not stoop without losing her consciousness. All these symptoms had been for two months rapidly increasing in intensity, and for two weeks almost a daily aggravation had been noticeable." * * *

"The patient was already aware of her imminent danger, and her only question was as to the *possibility* of relief. I told her in all probability the removal of the growth would be found impracticable; and that even if she survived the operation, which was not likely, the chances were a hundred to one that she would die of secondary affections; but still there was a bare possibility of success, and that while I would by no means advise an operation, yet if she, being fully aware of all the facts, insisted upon taking this desperate chance, I would undertake the removal of the tumour. I was happy to have my own views as to the propriety of this advice indorsed by Dr. Storer. She immediately decided upon its being done, and at once. Accordingly, in the presence and with the assistance of Prof. H. R. Storer, Dr. F. K. Paddock, and several students, I made the operation in the following manner: The patient, being etherized, was placed in the ordinary position for ligation of the carotid, and a single straight incision was made over the tumour, extending from the inferior maxilla to the clavicle. The anterior external jugular vein, which ran close by the line of the incision, was not injured. The sterno-mastoid, which was spread over the mass like a thin ribbon, and the several fasciæ, were successively divided upon a grooved director, and the areolar tissue with the knife and fingers, the handle of the scalpel being employed much more freely than the blade. On raising upon the director the little thin layer of fascia immediately investing the tumour, several veins were wounded and bled profusely; this was controlled by the fingers of an assistant, and the delicate envelope carefully reflected from the gland; but although this was done with the utmost caution and gentleness, several other veins were ruptured. I now found that the entire growth was completely covered with a network of these vessels; and so thin and tender were their walls that the forceps tore and the ligature cut their coats; and now, although the blade of the knife had not touched the surface of the tumour, so many of these veins were opened that, in spite of all the pressure that could be made, the hemorrhage was fearful. I now rapidly separated the areolar attachments, and in a few seconds was at the pedicle, which I found containing three large arteries, whose pulsations were very distinct, and which were my guides for dividing the pedicle into three parts, which I also accomplished with the fingers. I immediately tied each third with a ligature composed of eighteen strands of saddler's silk, *saturated* with wax and *loosely twisted*. As I drew the last cord all hemorrhage instantly ceased. The pedicle was carefully divided close to the goitre, and it removed. During the dissection, I found at one point the tumour quite firmly adherent to the sheath of the vessels; and, while separating it, a gush of venous blood indicated the rupture of a large vessel. The finger of an assistant controlled it until the ablation of the bronchocele, when examination proved the internal jugular to be wounded. This was tied with a ligature of three strands of silk loosely twisted; no other vessels needed interference. The entire operation occupied twenty-two minutes.

"After carefully sponging the wound and allowing the surface to glaze somewhat, the edges were united by interrupted sutures, water-dressing applied, and she placed in bed. The extremities were cool, and pulse feeble but regular, and less than ninety per minute. She reacted nicely, and passed a more comfortable

night than she had for weeks. The after-treatment consisted in perfect quiet, water-dressings when agreeable, anodynes *pro re nata;* the exhibition of muriated tincture of iron, twenty drops every four hours, and as much rich broth, gruel, and milk as she would take at regular intervals. For several days there was considerable irritation of the œsophagus and trachea, but not enough to interfere seriously with deglutition or respiration. This passed away, and she recovered without a bad symptom. The last ligature came away on the twenty-sixth day; in another week the wound was entirely healed, and she is now in perfect health and restored to a happy family."

[Dr. Greene must be congratulated on the fortunate termination of this case.]

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Ovariotomy.—Dr. J. F. MINER reports, in the No. of the *Buffalo Medical and Surgical Journal* for June last, a case of successful removal of a multilocular ovarian tumour, weighing twenty pounds; the pedicle has returned into the abdominal cavity, the ligatures being applied to the vessels separately and cut closely; and in the September No. of the same journal he records a case of multilocular ovarian tumour weighing nineteen and a half pounds with fatal results. The subject of the second case was 82 years of age, who had enjoyed good health until two years previously, when a tumour was discovered in the right side which had since steadily enlarged. The patient being fully anæsthetized, "an incision was made about three inches in extent down upon the tumour; very little fluid was contained in abdominal cavity outside the cysts. The hand was carefully introduced and the tumour found attached throughout its whole anterior surface to the peritoneum, by apparently recent attachments which were readily and easily broken. Trocar and canula was now introduced with the view to lessen the tumour and allow its extirpation through as small an opening as possible, in the abdominal walls. A large ovarian trocar was introduced and through the canula, after considerable time, oozed the thick, yellow, soap-like fluid, which comprised the contents of the two principal sacs opened. By this means the tumour was reduced to a mass weighing about five pounds, and elevated from its bed through an incision not over three inches in extent; care was taken that neither blood or the contents of the cysts should flow into the abdominal cavity. The pedicle was found small, and was ligated by a single silk cord and the extremities were then passed through the vaginal septum, as proposed in a report of a successful case, published in the July No., where the vessels of the cord were tied separately and the ligatures cut closely. * * * *

"The pedicle was returned after its ligation, and division with the ecraseur into the abdominal cavity, and the wound brought together with silver sutures introduced deeply, so as to inclose the edges of the peritoneum; water dressings, compress and bandage applied, and one-half grain morphia given subcutaneously.

"The patient soon roused from the influence of the ether and appeared as well as if no operation had been made."

The patient died fourteen days after the operation of diffused inflammation of the peritoneum.

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Gunshot Wound of the Bladder.—Dr. JAS. S. ATHON relates (*Cincinnati Journal of Medicine*, March, 1866) a very remarkable case of this, in a boy nine years of age, who, while in a stooping position, was shot by a pistol, the ball from which entered along the posterior margin of the tuberosity of the right ischium, and passed into the bladder near its fundus, coming out an inch and a half or two inches above the pubes, immediately in the linea alba.

The shock of the injury almost instantly prostrated the little fellow, and he was given up as lost. The urine at once escaped, mixed with blood, from both orifices, and the feces passed away involuntarily; however this complication seemed to be the result of the first effects of the injury, but the discharges from the bladder imparted a distinct stercoraceous odour, though not sufficiently to prove that the wound had any direct communication with the rectum.

A physician was called, who, after examination, pronounced the wound necessarily mortal, but gave something to ease pain. "An Eclectic physician was now

called, who plunged the largest sized silver catheter into the urethra, and with vigorous efforts succeeded in thrusting the instrument, not into the bladder, but into the membranous portion of the urethra, when the screams and contortions of the patient were so piteous that he was compelled to abandon the operation. The doctor thereupon decided the patient's case beyond the skill of the profession, though he continued several days, like his predecessor, to visit the patient; when the parents succeeded in procuring one of the regular faculty, who made an examination of the wound, and then, as he told me himself, declared the patient '*in articulo mortis.*' On the tenth day from the injury I was called in to see him, and found both orifices discharging urine and pus freely, attended with an intolerable fetor. Up to this time no urine had passed through the urethra. The patient was pale and shrunken, the pulse feeble and too quick to be correctly counted. The lower extremities were drawn up and bent upon themselves, with the right knee fixed against the opposite thigh, just about the lower third. The pain and tenderness in the pelvic region and along the course of the right limb, were so intense, that even the weight of the sheet, unless carefully adjusted, produced screaming and exhaustion. The feces were evacuated in the bed, and removed as best they could by means of cloths and water, thus adding to the already wretched condition of the patient by the excoriating effects of the dejections coming in contact with the nates and lower limbs. The tongue was coated with a heavy yellow fur, which was inclined to dryness. It occurred to me that if there were any chances for my patient's recovery, they must be sought for through an active, persevering and rational treatment; and although my first attention should have been directed to the immediate opening of the urethra, the weakened or depressed circulation, together with the very extensive chylopoietic derangement, and moreover, the extreme sensitiveness of the penis and appendages demanded a different course. I therefore evacuated the bowels with castor oil, and administered one grain of quinine in conjunction with one of hyoscyamus every two hours, until the patient was brought under the influence of the latter article, which was indicated by abatement of pain and a disposition to sleep. I found on the third day that this treatment had procured ease and slight tolerance of motion of the right knee. The discharge of pus and urine continued as profuse as ever from the wounds. There was no appearance of urine from the urethra, though the sensibility of this opening was decidedly less." It seemed to Dr. A. at this juncture that it was now desirable to direct, if possible, the urine and pus through the natural channel. In order to do this, he administered chloroform, and then introduced the smallest size catheter, "which met with no obstruction until it came into the vicinity of the membranous portion of the urethra, where the Eclectic had by his ignorance and bungling, caused so much mischief eight or ten days before, when the instrument could not be introduced further without making the case worse; it was in consequence withdrawn, and the quinine and hyoscyamus continued, with the addition of a hop poultice applied over the hypogastric and pubic regions." A nutritious diet was ordered. "The catheter was introduced every other day for a month, and every time the instrument was forced further, until it was finally made to enter the bladder without causing much pain, though every time it was introduced the chloroform had to be used. The frequent introduction of the catheter had blunted the sensibilities as well as enlarged the urethra. The urine and pus now began to escape from this orifice, which, notwithstanding the injury received in its membranous section, retained the fluid in the bladder until voided by the voluntary act of the patient. The quinine was now suspended, and the ext. hyoscyamus in grain doses, repeated three or four times a day, with the addition of a teaspoonful of the fluid extract of buchu at bedtime. The soreness in the region of the pelvis soon began to subside; the discharges from the wounds gradually diminished in quantity, and in the course of a month, the orifice in front closed up. The opening in the right nates continued to discharge urine and pus for nearly two months, but in comparatively small quantities. In proportion as the pus diminished, the opening on the hip assumed a healthy appearance, and when it ceased to pass, though it was somewhat mixed with the urine that was voided through the urethra, the wound closed up and became sound. At this writing the patient is enjoying his usual health."

NECROLOGY.—Died, on the 15th October, 1866, ROBERT W. GIBBES, M. D., of Columbia, South Carolina, æt. fifty-seven years.

The medical profession has ever been foremost in the cultivation of the sciences generally, and in the advancement of the varied steps of social progress and improvement, and in our own day none of its members have done more to sustain its reputation in these respects than the subject of the present notice.

Born in Charleston in 1809, and educated academically in the University of South Carolina, he received his medical degree in his native city in 1830, soon afterwards entering into the practice of his profession in Columbia, where he has just ended a life of extraordinary activity, distinction, and usefulness. For a long course of years he filled a large sphere, enjoying the support and confidence of one of the most enlightened and refined communities in our country; among whom he will ever be remembered as the chosen friend, adviser, and consoler of more than one generation.

His best eulogy will be found in a recital of the several positions occupied by him, and the work which he accomplished. Deeply imbued with the classic sentiment *Nihil humanum mihi alienum puto*, he entered with zealous ardour into all pursuits which tend to promote the general welfare. His early exhibition of talent and energy met with prompt appreciation. Immediately on leaving college he was appointed assistant to Dr. Thos. Cooper, professor of chemistry, geology, and mineralogy, and, on his death, became his successor in that chair. After his resignation of it, he continued the prosecution of his researches in geology and palæontology. His collection of fossils became a very extensive and valuable one; especially rich in specimens of the squalidæ, his monogram concerning which deservedly obtained for him high reputation.

In the midst of extensive professional employments he found time to teach and give lectures on medicine in conjunction with the distinguished Professor Josiah C. Nott, now of Mobile, and to prepare numerous papers for the Journals, displaying a rare versatility of powers, and an uncommon extent of reading and observation. We may point out as proof his "Memoir of the Fossil Genus Basilosaurus;" his monograph on fossil squalidæ, already referred to; his Lecture on "The Present Earth the Remains of a Former World;" and his contributions to the Southern Quarterly Review of articles on Palæontology; Ornithology; Animal Magnetism; Artesian Wells; Microscopical Examination of the Hair of the different Races; Railroads; Banks; The South Carolina College, of which he was for many years one of the trustees; Malaria; Early History of the Judiciary in South Carolina; Historical Discoveries on the Oregon Boundary. He also published three volumes of "Historical Documents of South Carolina," and a memoir of the lamented young painter Deveaux; meanwhile filling twice, by popular election, the office of Mayor of the city, and editing, with great spirit and success, a daily newspaper.

He was a devoted lover of the fine arts, and a munificent patron of artists; and his residence was the seat of a wide and generous hospitality. His fine collection of pictures and statuary, his library and museum are now dust and ashes, consumed with his home in the destruction of Columbia in 1865. His last days, therefore, were days of privation and suffering. Throughout the disastrous war, which terminated in that year of ruin, he had served his native State as surgeon-in-chief; winning for himself, in that position, the esteem and affection of friends and enemies alike, for his skill, humanity, and administrative ability.

He was for several years president of the Medical Association of South Carolina, and had been made a Fellow of many scientific and literary societies at home and abroad; among them the "Academy of Natural Sciences," the "Numismatic and Antiquarian Society," and the "Historical Society of Pennsylvania;" the "Oriental Society of New York;" the "National Institute," Washington; and the "Royal Society of Northern Antiquities," Copenhagen.

Shadows—naught else, we are;
And shadows all that, darkling, we pursue;
Our sun of hope, alas! a falling star;
Our lives, the morning dew.

S. H. D.

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